AUC
Alberta Utilities Commission

AECG Forty Mile Wind GP Corp.

Forty Mile Wind Power Project Amendments

November 8, 2023

Alberta Utilities Commission
Decision 27561-D05-2023
AECG Forty Mile Wind GP Corp.
Forty Mile Wind Power Project Amendments
Proceeding 27561
Applications 27561-A001 to 27561-A003

November 8, 2023

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The Commission may, no later than 60 days from the date of this decision and without notice, correct typographical, spelling and calculation errors and other similar types of errors and post the corrected decision on its website.

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1 Decision summary

1. In this decision, the Alberta Utilities Commission approves applications from RES Forty Mile Wind GP Corp. and AECG Forty Mile Wind GP Corp. to amend, construct and operate a wind power plant designated as the Forty Mile Wind Power Project, and to transfer ownership of the Forty Mile Wind Power Project and the Forty Mile 516S Substation from RES Forty Mile Wind GP Corp. to AECG Forty Mile Wind GP Corp.

2 Introduction

2.1 Application details

2. Pursuant to Approval 26910-D02-2021[1] and Permit and Licence 26910-D03-2021,[2] RES Forty Mile Wind GP Corp. (RES) had approval to construct and operate a wind power plant designated as the Forty Mile Wind Power Project and the Forty Mile 516S Substation. The project is located within the County of Forty Mile No. 8, approximately five kilometres east of Bow Island, Alberta.

3. On July 29, 2022, RES applied to the Commission to amend, construct and operate the Forty Mile Wind Power Project and the Forty Mile 516S Substation, and to split the Forty Mile Wind Power Project into two phases (collectively, the amended project). The amendments include a change of turbine model, which would result in the total turbine tip height increasing from 167.5 metres to 185.5 metres, the turbine rotor diameter increasing from 132 metres to 155 metres, and a reduction in the quantity of turbines from 115 to 70.

4. The Commission held an oral hearing in February 2023 to consider the amendment applications. Based on evidence received at the hearing, the Commission concluded that it required additional evidence in respect of certain aviation safety matters before making a final decision on the amendment applications.[3] Specifically, the Commission had concerns regarding the safety of aerial application flight operations in relation to wind turbines proposed to be located within five nautical miles of the Bow Island Airport (the affected turbines). As a result, the Commission initiated further process, including steps for additional evidence, information requests, and a virtual oral hearing related to the additional evidence (the additional process). The Commission also ruled that it would bifurcate its decision on the amended project, as between the affected turbines, and the other turbines (the unaffected turbines).[4]

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1 Power Plant Approval 26910-D02-2021, Proceeding 26910, Application 26910-A001, November 3, 2021.
2 Substation Permit and Licence 26910-D03-2021, Proceeding 26910, Application 26910-A002, November 3, 2021.
3 Exhibit 27561-X0227, AUC letter - Additional information requests and updated process schedule.
4 Exhibit 27651-X0231, AUC letter - Procedural ruling.

5. Decision 27561-D01-2023[5] was the first decision of the bifurcated process. It partially approved the amended project and granted the following approvals to RES:

- Approval 27561-D02-2023,[6] to construct and operate 27 turbines located outside a five nautical mile radius of the Bow Island Airport (the unaffected turbines) for Forty Mile Wind Power Project Phase 1.

- Approval 27561-D03-2023,[7] to construct and operate all 21 turbines for Forty Mile Wind Power Project Phase 2.

- Permit and Licence 27561-D04-2023,[8] to construct and operate the Forty Mile 516S Substation.

6. In this first decision, the Commission emphasized that any approval of the unaffected turbines, and any steps taken in reliance on those approvals, would not be considered in making the decision pertaining to the affected turbines.[9] The Commission added that it:

> … considers the incremental effects of the amended project as a whole, with the exception of issues associated with aeronautic safety at the Bow Island Airport that will be addressed in a separate decision. Further, since there is no dispute that turbines outside five nautical miles of the Bow Island Airport comply with the applicable federal aviation regulatory regime, issues of regulatory compliance will also be addressed in the separate decision.[10]

7. This decision is the second decision of the bifurcated process. In accordance with Decision 27561-D01-2023, this decision will consider issues associated with aviation safety at the Bow Island Airport, issues of regulatory compliance, and will finally determine whether the approval of the affected turbines is in the public interest.

8. The Commission notes that it considered issues associated with aerial spraying on lands located in proximity to turbines in Decision 27561-D01-2023.[11] In this decision, unless otherwise specified, the term aviation safety is specifically referring to the safety of aircraft operations when arriving at, departing from, or related flight paths in the immediate vicinity of the Bow Island Airport.

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5 Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023.
6 Power Plant Approval 27561-D02-2023, Proceeding 27561, Application 27561-A001, June 9, 2023.
7 Power Plant Approval 27561-D03-2023, Proceeding 27561, Application 27561-A002, June 9, 2023.
8 Substation Permit and Licence 27561-D04-2023, Proceeding 27561, Application 27561-A003, June 9, 2023.
9 Exhibit 27651-X0231, AUC letter – Procedural ruling.
10 Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, page 8.
11 Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, PDF pages 20-21, paragraphs 61-69.

9. The affected turbines are listed in the table below:

Table 1. Affected turbines

Phase	Turbines
Phase 1	T1, T10, T14, T15, T16, T17, T18, T19, T2, T20, T21, T22, T23, T29, T3, T30, T4, T5, T6, T7, T8, T9
Phase 2	N/A

10. The Commission notes that the *Generation Approvals Pause Regulation* was promulgated on August 3, 2023. However, as RES is seeking an amendment to an approval as described in Section 4.3.3 of Rule 007: *Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations, Hydro Developments and Gas Utility Pipelines* this approval is excluded from the pause.[12]

11. This decision will also consider an application filed by RES and AECG Forty Mile Wind GP Corp. (AECG) to transfer ownership of the amended project approvals to AECG as a result of a corporate name change.[13] As a result of the name change, the Commission will generally refer to the applicant as AECG in this decision for ease of reference, notwithstanding that many of the submissions were initially filed in the proceeding under the name RES.

12. AECG's applications and additional evidence included the following:

- An evaluation from NAV Canada, stating that the amended project is conditionally acceptable.[14]
- Evaluations from Shawn Sutherland and Doug Francoeur at Tetra Tech Canada Inc., including an initial summary,[15] an expert report,[16] and an expert report addendum.[17]
- An aviation risk analysis,[18] wake encounter simulation study,[19] and response to intervener evidence,[20] written by Dr. Jonathan Rogers of Persimia LLC.
- A Certificate of Amendment indicating that RES changed its name to AECG.[21]

[12] *Generation Approvals Pause Regulation*, Section 3(c).
[13] Exhibit 27561-X0295, RES Letter to AUC Re Change of Name.
[14] Exhibit 27561-X0042, NAV Canada Evaluation 2022-09-27.
[15] Exhibit 27561-X0052, Tetra Tech - 2018 FMWPP Aerodrome and Aviation Analysis.
[16] Exhibit 27561-X0236, Appendix A – Expert Report Addendum of Shawn Sutherland and Doug Francoeur of Tetra Tech Canada.
[17] Exhibit 27561-X0289, Appendix A – Expert Report Addendum Reply of Shawn Sutherland and Doug Francoeur of Tetra Tech Canada.
[18] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia LLC.
[19] Exhibit 27561-X0276, RES Aircraft Wake Encounter Simulation Study.
[20] Exhibit 27561-X0290, Appendix B – Expert Report Reply of Dr. Jonathon Rogers of Persimia, LLC.
[21] Exhibit 27561-X0295, RES Letter to AUC Re Change of Name, PDF page 3.

13. In the remaining sections of the introduction, the Commission will provide background information on the Bow Island Airport, an overview of the submissions of other participants in the additional process, and an outline of the structure of this decision.

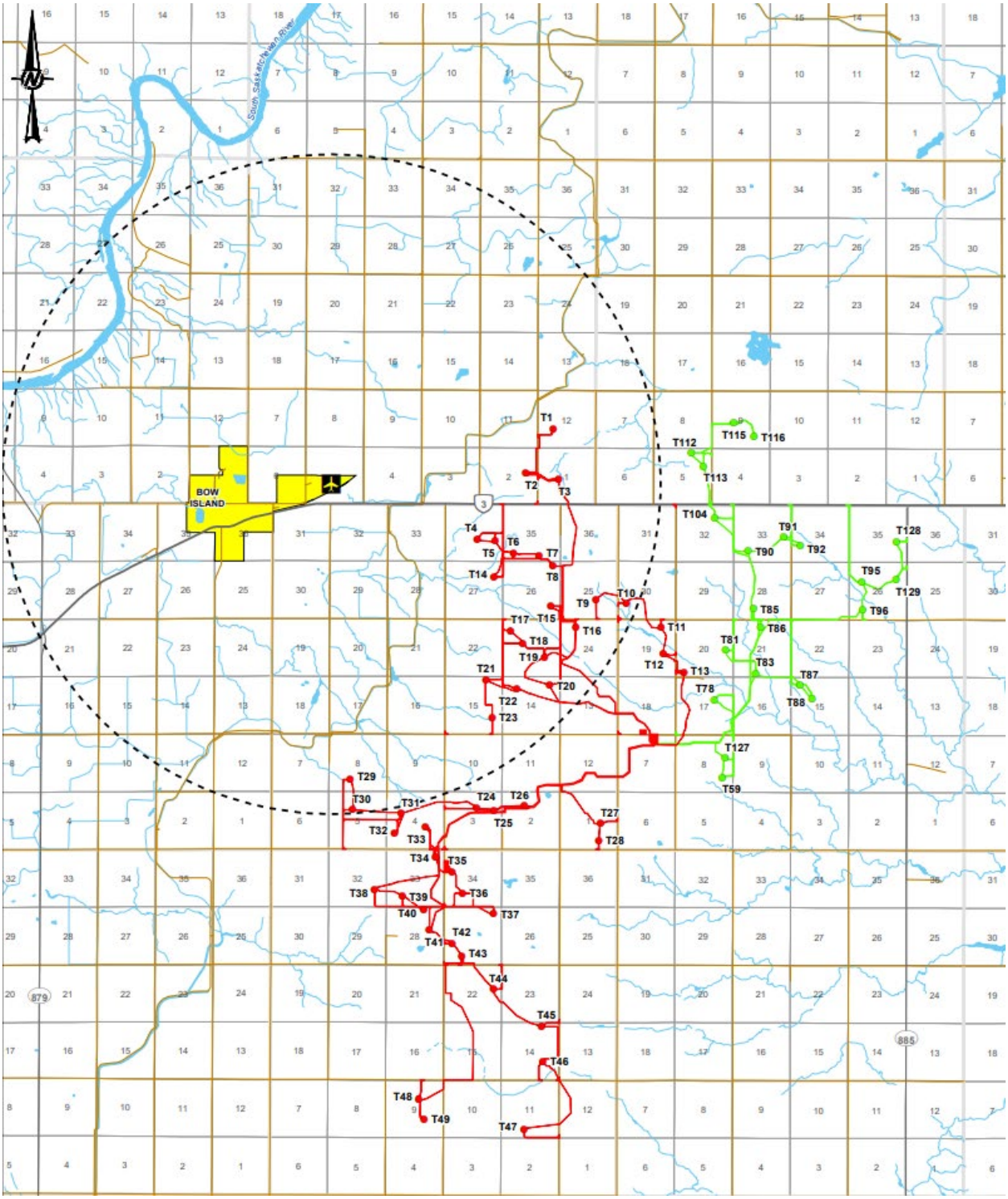
2.2 The Bow Island Airport

14. The Bow Island Airport is a registered aerodrome, with the airport identifier code CEF3. Despite not being an airport as that term is used in the federal aviation regulatory regime, the Commission will refer to it as the Bow Island Airport in this decision as it is the commonly used and commercial name for the aerodrome. It is located near the town of Bow Island and is municipally owned. The Bow Island Airport is used by aircraft operators during day and night hours in favourable weather conditions (visual flight rules or VFR). The Bow Island Airport has a single 3,000-foot asphalt runway.[22] There are also two grass cross strips at the Bow Island Airport that are located somewhat perpendicular to the to the asphalt runway.

15. AECG stated that the previously approved turbine closest to the Bow Island Airport was removed in the amended project. It explained that the amended project's closest turbine to the Bow Island Airport, Turbine T4, would be 4.1 kilometres away and the closest turbine in line with the flight path of the airfield would be over five kilometres away.[23] There would be 22 turbines within five nautical miles of the Bow Island Airport. The map below illustrates the 22 turbines located within a dotted line, which represents the five nautical mile radius from Bow Island Airport. The red dots represent Phase 1 turbines and the green dots represent Phase 2 turbines.

[22] Exhibit 27561-X0052, Tetra Tech - 2018 FMWPP Aerodrome and Aviation Analysis, PDF pages 2-3.
[23] Exhibit 27561-X0041, RES Forty Mile Wind GP Corp. - Submissions regarding statements of intent to participate, PDF pages 7-8.

Figure 1. Map of the project layout including the location of the Bow Island Airport[24]



[24] Exhibit 27561-X0072, RES Response to Hofmann IR 1-Request for Map.

2.3 Submissions from other participants in the additional process

16. As part of the additional process, the Commission provided Nathan Hofmann the opportunity to submit further evidence and arguments regarding aviation safety issues. N. Hofmann owns[25] and operates Top Crop Applicators Inc. (Top Crop), which is an aerial application company. N. Hofmann stated that Top Crop owns land at the Bow Island Airport and that Top Crop primarily operates from that airfield. Each pilot at Top Crop conducts hundreds of arrivals and departures from the Bow Island Airport each year, with Top Crop making 1,600 movements with company aircraft over the 2022 growing season alone.[26] N. Hofmann's evidence and argument included submissions on aviation impacts, safety impacts at the Bow Island Airport, the impact of wind turbines around aerodromes specifically related to aerial spraying aircraft, and the challenges aerial sprayers face when flying in and around wind turbines. N. Hofmann requested that the Commission find that the affected turbines are not in the public interest, or if the Commission approves the affected turbines, N. Hofmann requested several conditions.

17. No other parties were granted participation rights in the additional process; however, the Town of Bow Island submitted a letter explaining that it is the owner and operator of the Bow Island Airport and that it appreciated the Commission gathering further information on the impact that wind turbines would have on the flight operations at the airport.

2.4 Decision structure

18. This decision is structured as follows.

- In Section 3, the Commission begins with a discussion of the legislative and evidentiary framework that guides its decision-making. This includes a discussion of how the Commission considers expert evidence, and how these principles generally apply to persons in this proceeding.

- In Section 4, the Commission considers aviation safety issues, including: (i) compliance with the federal aviation regime; (ii) whether the affected turbine structures will impact aviation safety at the Bow Island Airport; (iii) whether wake turbulence from the affected turbines will impact aviation safety at the Bow Island Airport; and (iv) whether the aviation safety impacts of the affected turbines will increase risk at the Bow Island Airport to an unacceptable degree.

- In Section 5, the Commission discusses the amendment to existing approvals based on the applicant's name change from RES to AECG.

- In Section 6, the Commission provides its decision on the amended project.

3 Legislative and evidentiary framework

19. In this section, the Commission describes the legal landscape in which its decisions are made. First, the Commission explains its mandate and powers when considering a power plant application. Second, the Commission describes how it assesses the public interest, including how

[25] Nathan Hofmann is 50 per cent owner of Top Crop Applicators Inc. His wife owns the other 50 per cent.
[26] Exhibit 27561-X0091, Flight Safety Impact - Frequency of Airport Use.

this assessment will be conducted as a result of the bifurcated process in this proceeding. Finally, the Commission describes how it considers and weighs evidence, and provides guidance on how it will apply these principles in the circumstance of this proceeding.

3.1 The role of the Commission

20. The Commission is an independent, quasi-judicial agency of the province of Alberta. The Commission's powers are conferred on it by the provincial legislature and set out in legislation. As a quasi-judicial agency, the Commission is similar in many ways to a court when it holds hearings and makes decisions. Like a court, the Commission bases its decisions on the evidence before it and allows interested parties to cross-examine each other's witnesses to test the evidence as well as provide argument. Unlike a court proceeding, the Commission's proceedings are not matters between two or more competing parties to determine who wins and who loses. Instead, the Commission deals with specialized subject matter requiring it to assess and balance a variety of public interest considerations.

21. The applicant has the onus to demonstrate that approval of its application is in the public interest. Parties who may be directly and adversely affected by the Commission's approval of the application may attempt to show how the applicant has not met its onus. These parties may do so by bringing evidence of the effects of the project on their own private interests and explaining how the public interest may be better served by accommodating their private interests, and they may use the evidence filed by all parties to the proceeding to argue what a better balancing of the public interest might be. It is the Commission's role to test the application and the concerns raised about the project to determine whether approval is in the public interest.

22. The Commission recognizes that responding to an application requires a person's time and resources. In order to alleviate this burden, the Commission makes funding available to local interveners to enable them to hire legal representation, consultants and experts to assist with their participation.

3.2 The Commission's assessment of the public interest

23. As further explained in Decision 27561-D01-2023, the Commission holds hearings to determine an outcome that meets the public interest mandate set out in its enabling legislation. When the Commission receives an application to construct and operate a power plant, Section 17(1) of the *Alberta Utilities Commission Act* is engaged. This provision states that, in addition to any other matters it may or must consider, the Commission must give consideration to whether the proposed project is in the public interest, having regard to the social and economic effects of the project and its effects on the environment.[27]

24. As noted above, in Decision 27561-D01-2023, the Commission approved the unaffected turbines. The Commission confirmed that in reaching that decision, it had assessed the incremental impacts of the project as a whole – including the social, economic, and environmental effects of both the affected and unaffected turbines – with the exception of aerodrome-related safety concerns.

25. The Commission determined that these concerns should be considered in relation to turbines located within five nautical miles of the Bow Island Airport. The Commission therefore

[27] Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, paragraphs 12-16.

held that the aerodrome-related safety concerns would be considered in the subsequent decision.[28] The Commission later held that although this is an amendment application, in which the Commission generally only considers the incremental impacts of changes resulting from the amendment, the Commission would consider aerodrome-related safety impacts of the project as a whole.[29]

26. In determining whether the project is in the public interest, the Commission may assess aerodrome-related safety impacts. In some circumstances, the Commission may approve a project as in the public interest, notwithstanding that its interference with the safe use of an aerodrome renders that aerodrome unusable.[30] In other circumstances, the Commission may require a modification to the project, or impose conditions in respect of the project, to ensure that safety impacts to aerodrome users are adequately mitigated.

27. The assessment of aviation safety impacts is complex. The construction of any obstacle such as a wind turbine near an aerodrome, inherently increases safety risks associated with aerodrome use, in the sense that the presence of a turbine creates a non-zero risk of collision with the turbine, that would be zero in the absence of the turbine. The role of the Commission is not to ensure the project has zero safety risks, but to ensure that the adverse safety risks associated with the project are reasonable in the circumstances, and that the project does not increase aviation safety risks in manner that is not proportionate to the benefits of the project. This is a core aspect of the public interest balancing.

28. As further explained below, there are different ways the Commission may analyze aviation and aerodrome-related safety issues. One level of analysis is whether there are any issues of non-compliance with the federal aviation regulatory regime. Another level of analysis is whether the project is consistent with the concepts embedded in this regime, regardless of whether those concepts technically apply to the project under the regime. Beyond this analysis, the Commission may consider evidence of safety risks more generally. For example, the Commission may consider whether wake turbulence associated with a turbine is likely to cause aircraft structural failure or loss of control. The Commission may also consider whether, in light of existing circumstances, the project compounds the practical operational risks faced by pilots such that the project results in unacceptable aviation-related safety impacts.

29. The Commission has already determined that the amended project is in the public interest with the exception of these aviation safety issues for turbines within five nautical miles of the Bow Island Airport. If the Commission finds that there will be adverse impacts to aviation safety, the Commission will then consider whether an approval for the affected turbines should be issued in light of those impacts in conjunction with the projects benefits and adverse impacts as found in Decision 27561-D01-2023.[31]

[28] Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, paragraphs 17-24.
[29] Exhibit 27561-X0227, AUC letter - Additional information requests and updated process schedule, page 3, paragraph 8.
[30] Decision 27691-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, paragraph 63-64.
[31] Exhibit 27561-X0234, AUC letter – Procedural Ruling.

3.3 How the Commission considers and weighs different types of evidence

30. The Commission is not bound by the rules of evidence in its proceedings.[32] While this provides the Commission with flexibility to determine admissibility and weight of evidence, the Commission cannot ignore the principles that underlie the formal rules of evidence.[33] In judicial proceedings, a witness generally may only speak to personally observed facts, and not inferences or opinions derived from those facts. However, this general exclusionary rule is a presumption, and there are many exceptions.[34]

31. One exception is that a lay witness may provide opinion evidence that is a compilation of ordinary observations if: (1) they are in a better position than the decision-maker to form the opinion; (2) the opinion could be made by a person of ordinary experience; and (3) although not expert, the lay witness has the relevant experience to make the conclusion.[35]

32. Another common exception is for expert evidence. If a matter requires special knowledge or skill to form opinions based on the facts, a witness with sufficient expertise may be allowed to provide that opinion based on their level of expertise, if certain criteria are satisfied.[36] With respect to the level of expertise required, the decision-maker must be satisfied the person has a sufficient degree of expertise to provide the opinion, but there is no minimum degree of formal training required. Any deficiencies in expertise beyond that, go to the weight to be afforded to the evidence, not its admissibility.[37] For example, an expert in cattle nutrition may have sufficient expertise to provide opinion evidence on the effects of contaminants in cattle feed, although the nutritionist is not a toxicologist or a pathologist. However, the nutritionist's opinion evidence on such contaminants may be afforded less weight than conflicting evidence given by a toxicologist or pathologist.[38]

33. The law of evidence recognizes several distinct kinds of expert witnesses. As explained by the Court of Appeal of Alberta, these categories include: (a) independent expert witnesses who are retained to provide opinions, but who do not have other involvement in the underlying dispute; and (b) parties who have expertise, and who have an interest in the underlying dispute.[39]

34. Typically, if a matter requires special knowledge or skill to form opinions based on the facts, independent expert witness will provide those opinions. Those expert witnesses may be permitted to provide opinion evidence if certain criteria are satisfied, including that the witness be independent, impartial, and free from bias.[40] While the Commission does not qualify expert witnesses in advance, it generally requires the evidence of independent witnesses to comply with certain specifications.[41]

35. Canadian courts have concluded that, while they are able to admit opinion evidence from parties to the proceeding with expertise, they must not do so uncritically; the partisan perspective

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32 *Alberta Utilities Commission Act*, Section 20.
33 Decision 2011-436: AltaLink Management Ltd. and EPCOR Distribution & Transmission Inc. – Heartland Transmission Project, Application 1606609, Proceeding 457, November 1, 2011, paragraph 92.
34 *White Burgess Langille Inman v Abbott and Haliburton Co*, 2015 SCC 23 at paragraphs 14-15.
35 *O'Kane v Lillqvist-O'Kane*, 2021 ABQB 925 at paragraph 10.
36 *White Burgess* at paragraphs 15, 22-25.
37 *R v Marquard*, [1993] 4 SCR 223 at 243.
38 *Crooked Post Shorthorn v Masterfeeds Inc*, 2010 ABCA 106, paragraphs 16-22.
39 *Kon Construction Ltd v Terranova Developments Ltd*, 2015 ABCA 249, paragraph 35.
40 *White Burgess Langille Inman v Abbott and Haliburton Co*, 2015 SCC 23 at paragraphs 15, 22-25.
41 Rule 001: *Rules of Practice*, Section 21.

of a witness who has a vested interest in an outcome may colour their opinions. Even if the opinion evidence of the party with expertise is admitted, it is not necessarily entitled to be put on an equal footing with the evidence of independent experts, or given any weight at all.[42]

36. The Commission acknowledges the principle underpinning this judicial treatment of non-independent expert evidence, that the witness's personal interest in the outcome of the dispute may be prone to be influence the witness's evidence. The Commission will consider this principle in relation to non-independent expert witnesses.

37. The Commission wishes to emphasize that its requirement for expert evidence on some subject matter areas is not a reflection of how it views the relevance, truthfulness or pertinence of interveners' testimony. The Commission's reliance on expert witnesses to provide opinion evidence on certain subject matter areas does not mean that lay witnesses are not permitted to provide any testimony on these matters, nor that their evidence on these matters will not be considered by the Commission. Lay witnesses, both interveners and corporate witnesses for project proponents, are able to provide information within their personal knowledge, and may present their relevant observations in the form of opinions. In some cases, their personal knowledge may be extensive and detailed.

3.4 The Commission's consideration of expert evidence in this proceeding

38. In the additional process for this application, the Commission received evidence from N. Hofmann and the independent experts retained by AECG. In this section of the decision, the Commission will briefly discuss the general principles applicable to considering evidence from these different persons, and the scope of their expertise.

3.4.1 N. Hofmann

39. N. Hofmann is an intervener in this proceeding who, in addition to providing fact evidence related to his concerns about the project's impact on aviation safety, also provided opinion evidence based on his expertise. N. Hofmann provided opinion evidence based on: (i) his personal experience, (ii) his aviation expertise and certifications, and (iii) both his personal experience and his expertise.

40. In terms of N. Hofmann's expertise, N. Hofmann holds both a Commercial Pilot Licence, and an Aircraft Maintenance Engineer Licence. He is the chief pilot and operations manager of Top Crop, a position which involves performing aerial spraying operations, training and oversight of two other pilots, risk assessment of aviation operations, and management of flight safety issues. N. Hofmann personally has over 7,500 hours of flight experience in performing aerial spraying for agricultural operations in southern Alberta, accrued over the last 25 years. He is also a Director for the Alberta Aerial Applicators Association.[43]

41. During the hearing, N. Hofmann explained that while he did not have the type of scientific and theoretical expertise of Dr. Rogers, he did have a diplomas in mechanical engineering technology, majoring in aviation, and aircraft maintenance engineers technology from the Southern Alberta Institute of Technology, and that he had studied the theory and

[42] *O'Kane v Lillqvist-O'Kane*, 2021 ABQB 925, paragraph 26.

[43] Exhibit 27561-X0029, 40 mile land use: wind power 2022, PDF page 6; Exhibit 27561-X0046, Response to RES motion from Nathan Hofmann and Top Crop Applicators Inc., PDF page 1; Exhibit 27561-X0091, Flight Safety Impact - Frequency of Airport Use.

dynamics of flight beyond the level of a typical pilot.[44] N. Hofmann also explained that he had personal experience flying near wind turbines, and that he had personally felt wake turbulence when doing so.[45]

42. While several persons in this proceeding had experience piloting aircraft, the Commission considers that N. Hofmann's specific expertise as a pilot is unique in this proceeding. N. Hofmann conducts aerial spraying operations, and this typically involves taking off from the Bow Island Airport with an aircraft this is loaded over its design maximum gross weight, and occasionally landing in the overweight condition.[46] As explained below, N. Hofmann stated that Transport Canada's Type Certificate Data Sheet for Top Crop's aircraft allows for them to fly over the max gross weight published in operating handbooks.[47] In addition, aerial spraying operators engage in more frequent takeoffs and landings and more flight operations within feet of the earth's surface than most other pilots. N. Hofmann provided evidence that he conducts hundreds of arrivals and departures from the Bow Island Airport each year,[48] and that during its busiest days, Top Crop can conduct well over 30 flights from the Bow Island Airport.[49]

43. Based on this specialized knowledge and experience, the Commission is satisfied that N. Hofmann has sufficient expertise to provide evidence in this proceeding on a variety of matters. Specifically, the Commission finds that N. Hofmann has significant expertise with respect to the operation of his aerial spraying aircraft in and around the Bow Island Airport, the operation of his aerial spraying aircraft in and around wind turbines, assessing risks related to the operation of his aerial spraying aircraft in relation to turbines, and the operational impacts of turbulence on his aircraft in the context of his aerial spraying operations.

44. However, the Commission reiterates that while N. Hofmann has sufficient expertise to speak to these matters, the Commission will consider the degree of N. Hofmann's expertise as compared to other experts in this proceeding when weighing his opinion evidence.

45. While the Commission acknowledges that N. Hofmann is a participant with an interest in the outcome of this proceeding, we find that, at all stages of this proceeding, N. Hofmann was candid in his direct evidence and in answering the questions of the Commission, Commission counsel, and AECG. The Commission finds that N. Hofmann's interest in the outcome of this proceeding did not impair the impartiality of his opinion evidence, and that there is no need to discount the weight placed on his opinion evidence on the basis of his status as an intervener. Overall, the Commission considers that N. Hofmann was a credible and helpful witness throughout this proceeding.

46. In argument, AECG submitted that N. Hofmann did not have sufficient scientific and technical subject-matter expertise to conduct a literature review, summarize the results, and apply the conclusions from this analysis to the project.[50] The Commission has previously held that in order for it to accept a person's opinion on a body of scientific literature, or the relevance of a particular scientific document, it may require that person to have sufficient expertise to

[44] Transcript, Volume 6, pages 838 and 840.
[45] Transcript, Volume 6, page 820.
[46] Transcript, Volume 6, pages 846-847.
[47] Exhibit 27561-X0278, N Hofmann Information Response to RES, page 28 and Exhibit 27561-X0285, Item #7-Type Certificate Data Sheet A-91.
[48] Exhibit 27561-X0091, Flight Safety Impact - Frequency of Airport Use.
[49] Transcript, Volume 6, page 819.
[50] Transcript, Volume 7, page 886, lines 15-21.

provide that opinion. For example, in Decision 27240-D01-2023,[51] the Commission placed some weight on a literature review and summary regarding a risk assessment of the health impacts of wind turbines on animals, from an expert who had extensive education and professional experience in environmental science and health risks assessments related to turbines, where that expert had done a systematic and transparent review of the relevant literature. The Commission conversely placed no weight on a summary of several articles on the topic that was written by lawyer who had no relevant expertise in that area.[52]

47. With respect to the literature referred to by N. Hofmann, during the hearing N. Hofmann described his methodology by saying that "[b]asically, I've had to scrounge through the internet and find information as best I could on the subject…"[53] The Commission has considered N. Hofmann comments regarding these articles, and acknowledges N. Hofmann has some expertise in the subject matter underlying some of the articles. However, the Commission finds that this is not the sort of systematic and transparent review of a body of literature that would be sufficient for the Commission to place any weight on N. Hofmann's assessment of any consensus, or lack thereof, in the literature regarding turbulence.

3.4.2 Dr. Rogers

48. Dr. Rogers's qualifications include a PhD in Aerospace Engineering from the Georgia Institute of Technology, with a specialization in flight mechanics and controls. Dr. Rogers worked as an assistant professor of aerospace engineering at Texas A&M University, and from 2013 to the present has been employed as the Lockheed Martin Professor of Aerospace Engineering of Georgia Tech. Dr. Rogers is also the CEO and Founder of Persimia LLC, which since 2016 has provided independent engineering services and led research studies to evaluate the environmental impacts of wind farms and perform site-specific studies regarding renewable energy projects.[54]

49. During the hearing, Dr. Rogers described his primary area of expertise as "the interaction of aircraft with air mass and aerodynamics and controls."[55] Dr. Rogers further described that he has extensive experience in aircraft modelling, simulation, and flight dynamics, and that he has led numerous research projects, including for National Aeronautics and Space Administration, various branches of the United States military and the United States Department of Energy.[56] Dr. Rogers explained that while he has not published peer-reviewed studies on wind farm wake turbulence, he has completed work on wind farm modelling and wake modelling, and that he has given conference presentations on those subjects. Dr. Rogers also explained that in performing his work for this hearing, he used state-of-the-art models created by colleagues and collaborators, and that this type of collaboration was typical in the field of aerodynamics.[57]

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[51] Decision 27240-D01-2023: ENGIE Development Canada GP Inc. – Buffalo Trail Wind Power Project, Proceeding 27240, Applications 27240-A001 to 27240-A003, February 8, 2023.
[52] Decision 27240-D01-2023, paragraphs 105-111.
[53] Transcript, Volume 6, page 839, lines 4-6.
[54] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 21.
[55] Transcript, Volume 5, page 697, lines 12-15.
[56] Transcript, Volume 5, page 632.
[57] Transcript, Volume 5, pages 697-698.

50. N. Hofmann disputed whether Dr. Rogers had expertise regarding wake turbulence.[58] The Commission is satisfied that Dr. Rogers is a well-qualified expert in the subject of aerodynamics, aerodynamic modelling and aircraft dynamic responses in flight, and that the wake turbulence evidence Dr. Rogers provided in this proceeding falls within that scope of expertise.

3.4.3 Tetra Tech

51. Tetra Tech's evidence was provided by S. Sutherland, and D. Francoeur. S. Sutherland is a senior airport consultant with more than 40 years of experience in airport management, operations, maintenance and development.[59] D. Francoeur is a senior airport safety specialist with over 30 years of experience in aviation regulatory compliance.[60] D. Francoeur also stated that while he did not have experience aerial spraying, he had operated an aircraft in proximity to operating wind turbines at a distance of approximately one to two kilometres.[61] The Commission considers that S. Sutherland and D. Francoeur have sufficient expertise with respect to compliance with the federal aviation regulatory regime, and aviation risk assessments, as it relates to the Bow Island Airport to provide opinion evidence on this topic.

4 Discussion and findings related to aviation safety

52. As noted earlier, in the first decision, Decision 27561-D01-2023, the Commission concluded that the amended project was in the public interest, as its negative impacts could be mitigated to an acceptable degree, or were otherwise outweighed by the benefits of the amended project, subject to the conditions set out in Appendix C of that decision.[62] However, the Commission found that issues associated with aviation safety at the Bow Island Airport, and issues of compliance with the federal aviation regulatory regime, would be considered in a subsequent decision. Therefore, the Commission's finding with respect to the public interest for the portions of the project within five nautical miles of the Bow Island Airport, was expressly subject to the Commission's further consideration of aviation safety in this decision. The Commission also found the approvals issued in Decision 27561-D01-2023 could be amended to include the turbines considered in this decision.[63]

53. In this section of the Decision, the Commission finds that the amended project is in the public interest, subject to conditions set out in Appendix C in Decision 27561-D01-2023, and set out in this decision. The Commission assess the project's impacts related to aviation safety, as follows:

- In Section 4.1, the Commission reviews the federal aviation regulatory regime, and its application to the Bow Island Airport, and determines whether the amended project complies with the applicable requirements of the federal aviation regulatory regime.

[58] Transcript, Volume 5, page 934.
[59] Exhibit 27561-X0196, Appendix E - Expert Report and Curriculum Vitae of Shawn Sutherland of Tetra Tech Canada Inc., PDF page 24.
[60] Exhibit 27561-X0236, Appendix A – Expert Report Addendum of Shawn Sutherland and Doug Francoeur of Tetra Tech and Curricu, PDF page 17.
[61] Transcript, Volume 5, page 650, lines 24-25.
[62] Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, paragraph 99.
[63] Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, page 27, paragraph 100.

- In Section 4.2, the Commission assesses whether the affected turbine structures will impact the safety of operations at the Bow Island Airport.

- In Section 4.3, the Commission assesses whether wake turbulence from the affected turbines will impact the safety of operations at the Bow Island Airport.

- In Section 4.4, the Commission analyzes how the risk to pilots may be impacted by the amended project's impacts to aviation safety at the Bow Island Airport. The Commission also determines whether it will impose conditions to mitigate any increased risk.

- In Section 4.5, the Commission determines whether approval of the affected turbines is in the public interest.

4.1 Does the project comply with the requirements of the federal aviation regulatory regime?

54. This section will first provide an overview of the federal aviation regulatory regime. It will then discuss how the relevant federal regulatory regime applies to the Bow Island Airport and the amended project. Lastly, the Commission will determine whether the project complies with the requirements of the federal aviation regulatory regime.

55. Consistent with its past decisions, in this section the Commission finds that the relevant federal aviation regulatory documents do not contain a prohibition on siting wind turbines at a particular distance from the Bow Island Airport. In this regard, the amended project is compliant with the applicable requirements of the federal aviation regulatory regime. However, the Commission also finds that compliance with existing regulatory standards is insufficient to determine whether approval of the affected turbines is in the public interest given the evidence in this proceeding related to aviation safety concerns at the Bow Island Airport.

4.1.1 The federal aviation regulatory regime

56. The federal Minister of Transport, through Transport Canada, regulates aviation matters in Canada, pursuant to the *Aeronautics Act*, the *Canadian Aviation Regulations*, and related enactments and documents.

57. The *Aeronautics Act* defines an aerodrome as including any area of land that is set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft.[64] Transport Canada recognizes three categories of aerodromes. These three categories are:

- Aerodromes (small airstrips located on private property that are neither registered nor certified).

- Registered aerodromes.

- Certified aerodromes, referred to as airports.[65]

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[64] *Aeronautics Act*, RSC 1985, c A-2, s 3(1) "aerodrome".

[65] See for example Transport Canada, TP13549 *Sharing the Skies – An Aviation Industry Guide to the Management of Wildlife Hazards*, 2nd edition, March 2004, Chapter 6: Airports, online: https://tc.canada.ca/en/aviation/publications/sharing-skies-guide-management-wildlife-hazards-tp-13549/chapter-6-airports.

58. Transport Canada describes requirements for registered aerodromes, such as the Bow Island Airport, as follows:

> While listed, registered aerodromes are not certified as airports in the Canada Flight Supplement (CFS)—a publication for pilots containing operating information for registered aerodromes and airports. Registered aerodromes are not subject to ongoing inspection by Transport Canada; however, they are inspected periodically to verify compliance with Canadian Aviation Regulations (CARs) and to ensure the accuracy of information published in the CFS and the Water Aerodrome Supplement (WAS). In spite of these efforts, pilots planning to use a registered aerodrome are still expected to contact aerodrome operators to confirm CFS information is current.[66]

59. NAV Canada is a federal not-for-profit corporation that owns and operates Canada's civil air navigation system and provides air navigation services, such as aviation weather reporting and aviation information, to pilots, including publishing the Canada Flight Supplement. NAV Canada also assesses all land use proposals near aerodromes, including evaluating impacts to existing procedures, to ensure that safety and efficiency are not compromised.[67]

60. Transport Canada produces a number of publications related to civil aviation and aerodromes in Canada. Two of these publications are of particular relevance to this proceeding:

- TP312 *Aerodrome Standards and Recommended Practices* (TP312).
- TP1247 *Aviation Land Use in the Vicinity of Aerodromes* (TP1247).

61. The Commission has consistently recognized a distinction "between TP312, which is a standards document, and TP1247, which is a guidance document."[68] These documents are discussed below.

4.1.2 How does the federal aviation regulatory regime apply to the Bow Island Airport and the project?

62. The Bow Island Airport is a registered aerodrome designated as CEF3 in the Canada Flight Supplement. It is listed as having a single 3,000-foot by 75-foot asphalt runway, designated as Runway 05/23.[69] CEF3 has no aircraft instrument flight rules approach/departure procedures published for use by aircraft operators at the aerodrome in official aviation publications of Canada.[70]

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66 Transport Canada, TP13549 *Sharing the Skies – An Aviation Industry Guide to the Management of Wildlife Hazards*, 2nd edition, March 2004, Chapter 6: Airports, online: https://tc.canada.ca/en/aviation/publications/sharing-skies-guide-management-wildlife-hazards-tp-13549/chapter-6-airports.

67 Exhibit 27561-X0042, NAV Canada Evaluation 2022-09-27.

68 Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023, paragraph 81.

69 Exhibit 27561-X0090, Land Use Bylaw Request – 2017, PDF page 1. 05/23 refers to the magnetic heading aligned with each approach to the runway surface.

70 Exhibit 27561-X0052, Tetra Tech - 2018 FMWPP Aerodrome and Aviation Analysis, PDF page 2 and Exhibit 27561-X0051, RES Forty Mile Wind GP Corp. - Response to N. Hofmann and A. Jenkins Submissions, PDF page 3, footnote 13.

63. Below, the Commission assesses whether the relevant federal aviation regulatory documents apply to the Bow Island Airport, and therefore, how the federal aviation regulatory regime applies to the project.

4.1.2.1 TP312 Aerodrome Standards and Recommended Practices

64. TP312 sets out the standards and recommended practices for aerodromes in Canada and establishes the minimum level of compliance required for the planning and design of airport infrastructure.

65. The current version of TP312 is the 5th edition, which came into force in 2015, and was most recently amended in 2020. The previous version of TP312, the 4th edition, was in force between 1993 and 2015.

66. TP312 4th edition references a concept called an obstacle limitation surface. An obstacle limitation surface establishes limits to which objects may project into the airspace associated with an aerodrome. An obstacle limitation surface is a protective area for take-off, approach and transition areas that surround the runways of certified aerodromes or registered aerodromes with published instrument approach procedures.[71] There are several types of obstacle limitation surfaces defined in TP312 4th edition, each of which describes a different geometric plane extending from an aerodrome. One type of obstacle limitation surface identified in TP312 4th edition is called the outer surface, which is established at an elevation of 45 metres above the aerodrome and extends outwards to a radius of 4,000 metres.

67. As described above, TP312 5th edition came into force in 2015 and, among other revisions, made changes to the obstacle limitation surfaces that were previously defined in the 4th edition. Specifically, TP312 5th edition defines four types of obstacle limitation surfaces: inner transitional surfaces, transitional surfaces, takeoff surfaces, and approach surfaces. Notably, the outer surface (as described in TP312 4th edition) was not retained as an obstacle limitation surface. TP312 5th edition still discusses a geometrical plane established at an elevation of 45 metres and extending outwards in all directions to a distance of 4,000 metres; however, this plane is described as an obstacle *identification* surface, and not an obstacle limitation surface. The placement of structures within the obstacle identification surface is not prohibited.[72]

68. An obstacle identification surface assists in identifying obstacles that require assessment as part of airspace protection for aircraft maneuvering in the vicinity of an aerodrome.[73] TP312 5th edition states that an object infringing on an obstacle identification surface is to be reported to the aviation information service provider (i.e., NAV Canada) and Transport Canada for further assessment regarding:

(a) The requirement to light, mark or chart the object.

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[71] Exhibit 27561-X0052, Tetra Tech - 2018 FMWPP Aerodrome and Aviation Analysis, PDF page 2.

[72] Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023, paragraphs 70-74; Exhibit 27561-X0196, Appendix E - Expert Report and Curriculum Vitae of Shawn Sutherland of Tetra Tech Canada Inc., PDF pages 8, 14.

[73] Exhibit 27561-X0196, Appendix E - Expert Report and Curriculum Vitae of Shawn Sutherland of Tetra Tech Canada Inc., PDF page 8.

(b) Any impact on visual flight rules arrival/departure and circuit procedures.

(c) Any impact on instrument flight rules arrival/departure procedures.

(d) Any impact on aerodrome zoning regulations, where applicable.

69. Tetra Tech noted that aerodromes may undertake the design of instrument approach procedures for use on their runways, which is not the case at the Bow Island Airport. Tetra Tech explained that where no instrument approach procedure is published, such as at the Bow Island Airport, aircraft operators use visual flight rules. It explained that operating an aircraft safely under visual flight rules is based on the principle of see and avoid, while maintaining positive control.[74]

70. While there was some debate, eventually a consensus was reached that the requirements in TP312 5th edition do not apply to the Bow Island Airport.[75] The Commission agrees. The Commission also agrees with Tetra Tech that since the Bow Island Airport is not a certified aerodrome or a registered aerodrome with an instrument approach procedure published or under development, it is not required by regulation to protect for obstacle limitation surfaces.[76] As the Bow Island Airport is not required to comply with TP312 5th edition,[77] the Commission finds that TP312 5th edition does not impose restrictions on the erection of structures or other obstacles near the Bow Island Airport.

4.1.2.2 TP1247 Aviation Land Use in the Vicinity of Aerodromes

71. As noted above, TP1247 is a guidance document. The introduction of TP1247 states:

> This publication is designed to assist planners and legislators at all levels of government in becoming familiar with issues related to land use in the vicinity of aerodromes.
>
> Municipal planners and developers must understand that how land is used around an aerodrome will have an impact on the aerodrome's operations. The land use around aerodromes can have significant impacts on safety at the aerodrome and can negatively impact the operational viability of the aerodrome to the detriment of the local community that depends upon it.[78]

72. As the current edition of TP1247 pre-dates the coming into force of TP312 5th edition in 2015, it defines obstacle limitation surface to include an outer surface. Additionally, TP1247 describes the dimensions of an outer surface using similar language to that used in TP312 4th edition, namely at an elevation of 45 metres and extending to a horizontal distance of at least 4,000 metres.

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74 Exhibit 27561-X0196, Appendix E - Expert Report and Curriculum Vitae of Shawn Sutherland of Tetra Tech Canada Inc., PDF page 10.

75 Exhibit 27561-X0052, Tetra Tech - 2018 FMWPP Aerodrome and Aviation Analysis, PDF page 2; Transcript, Volume 3, page 482, line 21 to page 483, line 22.

76 Exhibit 27561-X0052, Tetra Tech - 2018 FMWPP Aerodrome and Aviation Analysis, PDF page 2; Exhibit 27561-X0196, Appendix E - Expert Report and Curriculum Vitae of Shawn Sutherland of Tetra Tech Canada Inc., PDF page 8.

77 *Canadian Aviation Regulations*, SOR 96-433, subpart 302; Exhibit 27561-X0219, Attachment U9.2 – TP312 5th Edition.

78 Exhibit 27561-X0088, tp1247e, PDF page 3.

73. N. Hofmann submitted that TP1247 shows planners that wind turbines create unique impacts and problems for aerodromes and aviation. N. Hofmann submitted that AECG "feels justified in ignoring this document because it is not law."[79] N. Hofmann added that TP1247 provided guidance to planners to utilize an outer surface area appropriate to the intended use of the aerodrome.

74. Tetra Tech disagreed with N. Hofmann's views on TP1247 and submitted that it is a guidance document for planners and that it is not a substitute for regulation or standards. Tetra Tech added that TP1247 does not impose any responsibilities on municipalities or provinces, it merely provides planning guidance.[80]

75. The Commission agrees with Tetra Tech and, consistent with its previous decisions, finds that TP1247 is a guidance document that is intended to assist planners in becoming familiar with aerodrome land use planning issues, but does not bind the Commission.[81] Also consistent with its previous decisions, the Commission finds that TP1247 does not impose restrictions on the erection of structures or other obstacles near a registered aerodrome.[82]

4.1.2.3 Canada Flight Supplement

76. The Canada Flight Supplement is a manual published by NAV Canada, which contains aviation information that is required for VFR flight, but that is not included on visual aviation charts or maps. It contains graphical depictions of all certified aerodromes and registered aerodromes along with information concerning navigation aids and facilities. The information is collected and provided under Transport Canada's general authority to regulate and co-ordinate aviation in Canada.[83]

77. The Canada Flight Supplement defines an aerodrome's obstacle clearance circle as follows:

> The obstacle clearance circle is a guide for pilots operating [under visual flight rules] within close proximity to aerodromes and should not be construed as providing minimum descent altitudes.
>
> The single altitude associated with [obstacle clearance circle (OCC)], determined by adding 1000' to the highest obstruction [above sea level (ASL)] located within the same geographic area that the circle describes and rounded up to the next 100 foot increment, is shown. An obstacle may be a man-made structure or a topographic height feature.[84]

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79 Exhibit 27561-X0087, Flight Safety Impact - TP 1247E, PDF page 1.

80 Exhibit 27561-X0289, Appendix A – Expert Report Addendum Reply of Shawn Sutherland and Doug Francoeur of Tetra Tech Canada, PDF page 5.

81 See Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023, page 20, paragraph 82.

82 See Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023, page 20, paragraph 84.

83 Described in the Transport Canada Aeronautical Information Manual (AIM) chapter, MAP – Aeronautical Charts and Publications. Example available: https://tc.canada.ca/sites/default/files/2021-09/AIM-2021-2_MAP-E.pdf

84 Exhibit 27561-X0220, Attachment U10 - Page General A51 Canada Flight Supplement.

78. The obstacle clearance circle extends to a radius of five nautical miles around an aerodrome.[85]

79. NAV Canada evaluated the amended project and found it conditionally acceptable. In its assessment, NAV Canada noted that the amended project would cause the altitude associated with the obstacle clearance circle for the Bow Island Airport to increase by 100 feet, to 4,500 feet above sea level.[86]

80. N. Hofmann raised concerns about the amended project's impacts to the Bow Island Airport's obstacle clearance circle, and recommended that the amended project not be allowed within the five nautical mile obstacle clearance circle of the Bow Island Airport, submitting that:

> Even though there are currently no laws on placing Wind Turbines within the [obstacle clearance circle] of an airport, it doesn't make it responsible to do so. Pilots use proper airmanship habits to guide them in the many cases where the rules and laws are lacking. RES should do the same. Just because there is no law to keep them from having a negative impact on Air Safety doesn't mean they are justified in pushing their project into the airspace that is critical to pilots conducting safe arrivals and departures. [87]

81. Tetra Tech submitted that the obstacle clearance circle is a construct of NAV Canada to advise pilots of obstacles in the vicinity of an aerodrome. Tetra Tech stressed that an obstacle clearance circle does not limit the height of obstacles in any way.[88]

82. The Commission recognizes that while the altitude associated with the Bow Island Airport's obstacle clearance circle will be increasing by 100 feet as a result of the amended project, the Canada Flight Supplement's definition of an obstacle clearance circle explains that an obstacle clearance circle is a guide for pilots operating under visual flight rules within close proximity to aerodromes. Therefore, the Commission finds that an obstacle clearance circle does not impose restrictions on the erection of structures or other obstacles near a registered aerodrome that does not have a published instrument flight rules procedure.

4.1.3 Conclusion regarding compliance with the requirements of the federal aviation regulatory regime

83. The Commission finds that the amended project will comply with the applicable federal aviation regulatory regime. As previously noted by the Commission, compliance with existing regulatory standards is an important part of the Commission's consideration of the amended project. Compliance with existing regulatory standards is a starting point to the Commission's assessment of aviation safety. However, it may not be determinative in all circumstances, particularly, as in this proceeding, where the Commission is presented with a significant degree of project-specific evidence related to aviation safety.

84. Based on the evidence in this proceeding, the Commission does not believe that compliance with existing regulatory standards is sufficient to determine whether the amended project poses risks to aviation safety. Therefore, the Commission will further assess the amended

[85] Exhibit 27561-X0236, Appendix A – Expert Report Addendum of Shawn Sutherland and Doug Francoeur of Tetra Tech, PDF page 5.
[86] Exhibit 27561-X0042, NAV Canada Evaluation 2022-09-27.
[87] Exhibit 27561-X0079, Flight Safety Impact - Reduced Airspace, PDF page 1.
[88] Exhibit 27561-X0289, Appendix A – Expert Report Addendum Reply of Shawn Sutherland and Doug Francoeur of Tetra Tech Canada, PDF page 18.

project's impacts on aviation safety at the Bow Island Airport during takeoff and landing of aerial applicator aircraft. In the following two sections, the Commission will assess whether the affected turbine structures and wake turbulence from the affected turbines, respectively, constitute hazards that will impact the safety of aviation operations at the Bow Island Airport.

4.2 Will the affected turbine structures impact the safety of the aviation operations at the Bow Island Airport?

85. In assessing whether the affected turbines structures constitute hazards that will impact the safety of aviation operations at the Bow Island Airport, the Commission first determines whether specific impacts to the use of the grass cross strips at the Bow Island Airport should be considered as part of its assessment of aviation safety impacts. Next, the Commission determines whether the amended project complies with the obstacle limitation surfaces as described in TP312 5th edition. Lastly, the Commission determines whether any of the affected turbine structures constitute a physical obstacle that will create an unacceptable hazard within the circuits flown at the Bow Island Airport.

4.2.1 Are there any specific impacts to the use of the grass cross strips at the Bow Island Airport as part of its assessment of aviation safety impacts?

86. N. Hofmann testified that there are two grass cross strips at the Bow Island Airport that are located somewhat perpendicular to the asphalt runway. N. Hofmann has been investing time and money to renovate the old grass cross strips and explained that the strip that runs north and south is now usable, while the other grass cross strip remains under construction.[89] N. Hofmann submitted that the grass cross strips would become useful during higher wind speeds that make crosswind landings on the asphalt runway very challenging, unsafe, or impossible and expressed concerns that the amended project would impact safety when using the grass cross strips.[90]

87. Tetra Tech submitted that the grass cross strips are not established runways and are not published in the Canada Flight Supplement. AECG pointed out that the amended project's 4,000-metre setback from the Bow Island Airport also applied to the grass cross strips. Further, it noted that since the grass cross strips would be used primarily for landing in emergency situations, the circuit to be flown to them, if any, would be smaller than normal, which would further alleviate concerns.[91]

88. The Commission acknowledges that while the Bow Island Airport's grass cross strips are not published within the Canada Flight Supplement, they may provide additional options for pilots flying during emergency situations when landing at the Bow Island Airport. However, the Commission also acknowledges that since the grass cross strips are not published, they would not commonly be used by pilots unfamiliar with the Bow Island Airport and its surroundings.

89. Based on the above, the Commission finds that any potential safety impacts caused by the amended project to the grass cross strips would be similar to the safety impacts caused to Runway 05/23, and therefore, its assessment of the aviation safety impacts to the use of Runway 05/23 will capture any aviation safety impacts to the use of the grass cross strips.

[89] Transcript, Volume 6, pages 825-826.
[90] Exhibit 27561-X0249, Nathan Hofmann's answers to AUC questions, PDF page 45 and Exhibit 27561-X0269, Attachment #20 – Grass Cross Strips – Southerly Winds.
[91] Transcript, Volume 7, page 823.

4.2.2 Based on Tetra Tech's illustrative obstacle limitation surface analysis, does the amended project comply with TP312 5th edition?

90. Notwithstanding its determination in Section 4.1 that the Bow Island Airport is not required to comply with TP312 5th edition and that TP312 5th edition does not impose restrictions on the erection of structures or other obstacles near an aerodrome, such as the Bow Island Airport, the Commission is of the view that compliance with the obstacle limitation surfaces in TP312 5th edition is one indicator of whether safe aviation operations can be carried out at an aerodrome. However, the Commission emphasizes that while compliance with the obstacle limitation surfaces in TP312 5th edition is a factor to consider in assessing the amended project's impacts on aviation safety at the Bow Island Airport, based on the evidence in this proceeding, other relevant factors must also be considered.

91. N. Hofmann argued that any turbulence emanating from a turbine should also be considered an "obstacle" for the purposes of the obstacle management analysis under the Transportation Canada documents. Dr. Rogers noted that any fixed obstacle will create some level of turbulence, and that mountainous terrain can also create turbulence, and that this turbulence would not be marked as an obstacle.[92]

92. The Commission notes that wake turbulence is not explicitly mentioned as an obstacle in the Transport Canada documents, although wind turbines are explicitly stated to be obstacles. Based on the context of the use of the word "obstacle" in the Transportation Canada documents, wake turbulence does not appear to be contemplated by that term.[93] For example, TP1247 contains a section that specifically addresses wind turbines and wind farms. This section states that "[a]lthough a wind turbine can be considered as just another object that is deemed an obstacle and thus in need marking and lighting, there are additional issues that should be addressed through consultation in the early stages of planning."[94] The document then goes on to list some considerations that are specific to turbines, and yet it does not identify wake turbulence.[95]

93. For these reasons, the Commission will not consider wake turbulence as an obstacle for the purposes of the Transportation Canada documents. Nevertheless, consistent with its past practices, the Commission may still consider wake turbulence as a hazard for aircraft for the purposes of the Commission's assessment of aviation safety.[96]

94. Tetra Tech provided an illustrative analysis of the obstacle limitation surfaces in TP312 5th edition to demonstrate that, notwithstanding that compliance is not compulsory, the amended project would comply with TP312 5th edition. The analysis showed illustrative obstacle limitation surface configurations out to 2,500 metres from the end of each runway strip.[97]

95. Tetra Tech stated that the nearest amended project turbine would be located approximately 4.1 kilometres southeast of the Runway 23 threshold, and would therefore be well

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92 Transcript, Volume 5, pages 652-653.

93 See Exhibit 27561-X0219, Attachment U9.2 - TP312 5th Edition, PDF page 36, section 2.3.1.1(g)(x); Exhibit 27561-X0088, tp1247e, PDF pages 8, 34.

94 Exhibit 27561-X0088, tp1247e, PDF page 33.

95 Exhibit 27561-X0088, tp1247e, PDF pages 33-34.

96 Decision 27591-D01-2023, paragraphs 91-92.

97 Exhibit 27561-X0196, Appendix E - Expert Report and Curriculum Vitae of Shawn Sutherland of Tetra Tech Canada Inc., PDF pages 20 and 21.

outside of the illustrative obstacle limitation surfaces. It added that if an illustrative obstacle identification surface were applicable, the nearest turbines would also be beyond the obstacle identification surface boundaries described in TP312 5th edition, by virtue of being more than 4,000 metres from the Bow Island Airport.

96. On that basis, the Commission agrees with Tetra Tech's analysis and finds that none of the affected turbines would penetrate an obstacle identification surface, let alone an obstacle limitation surface. Therefore, the amended project complies with TP312 5th edition.

97. However, AECG and N. Hofmann had differing views regarding how the Commission should consider compliance with TP312 5th edition as part of its assessment of aviation safety.

98. Tetra Tech emphasized that obstacle limitation surface standards are sufficient, adequate, and universal, explaining that aerodrome standards detailed in International Civil Aviation Organization publications, including obstacle limitation surfaces, are the basis for regulated aviation standards around the world, including TP312 5th edition. Tetra Tech argued that Canada's aerodrome standards are, therefore, not arbitrary, but established on the basis of sound risk management and are consistent with standards that are adopted internationally.[98]

99. The Commission accepts that TP312 5th edition is not arbitrary and notes that it was developed by Trasport Canada, the expert body for aviation regulation. However, as discussed above, compliance with TP312 5th edition is insufficient to demonstrate that the amended project will not impact aviation safety at the Bow Island Airport. Instead, it is one of several factors that the Commission will consider in assessing impacts to aviation safety.

100. Conversely, N. Hofmann argued that TP312 5th edition was inadequate for proper planning regarding wind turbines around aerodromes, and inadequate for use as a flight safety or best practices manual for wind energy and aviation.[99]

101. The Commission finds that the amended project complies with TP312 5th edition, and that such compliance indicates that safe aviation operations at the Bow Island Airport are possible if the amended project is constructed. However, compliance with TP312 5th edition is not determinative of the issue of aviation safety in this proceeding, in particular given N. Hofmann's concerns about over maximum gross weight aerial applicators taking off and landing at the Bow Island Airport.

4.2.3 Will the affected turbine structures create a hazard within the circuits flown at the Bow Island Airport?

102. A circuit generally refers to a standardized rectangular pattern flown by aircraft when approaching or departing from an aerodrome. Circuits are established at all uncontrolled aerodromes[100] to provide a consistent and predictable flight profile.[101]

[98] Exhibit 27561-X0236, Appendix A – Expert Report Addendum of Shawn Sutherland and Doug Francoeur of Tetra Tech and Curricu, PDF page 11.

[99] Exhibit 27561-X0249, Nathan Hofmann's answers to AUC questions, PDF page 53.

[100] An uncontrolled aerodrome refers to the absence of air traffic control over all aircraft movements, and instead relies on pilots to broadcast intentions and remain safely clear of other aircraft.

[101] Exhibit 27561-0236, Appendix A – Expert Report Addendum of Shawn Sutherland and Doug Francoeur of Tetra Tech.

103. AECG's and N. Hofmann's views differed on how the affected turbine structures may impact circuits at the Bow Island Airport.

104. Tetra Tech submitted that an aircraft circuit would vary depending on the weather, type of aircraft, speed of aircraft and other factors and it emphasized that the amended project's turbines would be in fixed, known locations. It added that a pilot would have ample opportunity to climb to a height that is sufficiently comfortable within a normal circuit to clear the amended project's wind turbines.[102] Tetra Tech argued that circuits at lower altitudes and circling to land procedures should take place within four kilometres of the runway, away from the amended project's turbines.

105. N. Hofmann stated that Transport Canada's Type Certificate Data Sheet for Top Crop's aircraft allows for them to fly over the maximum gross weight published in operating handbooks.[103] N. Hofmann further submitted that clearing wind turbines near the Bow Island Airport would not be possible for Top Crop's aircraft when normally loaded for application without some form of circling or diversion of flight path.[104] N. Hofmann submitted that if a heavy loaded aerial application aircraft could climb 200 feet per minute, it would have to fly 10.4 miles to reach the safe height required to fly over the amended project, and as a result, none of the 22 turbines within the five nautical miles of the Bow Island Airport could be safely flown over top of by an aerial applicator. N. Hofmann submitted that this would force Top Crop's pilots to have to fly next to and around the amended project.[105] N. Hofmann stated that when returning to the airport in an over maximum gross weight condition, the aircraft circuit would be much bigger.

106. N. Hofmann provided some GPS flight data of missions he had flown from the Bow Island Airport[106] and confirmed during questioning that during some of these flights, the aircraft did not perform a circuit on takeoff or landing, but that it did use portions of the circuit, particularly for landing.[107]

107. N. Hofmann argued that the Commission should impose a turbine-free outer surface with a five nautical mile radius around the Bow Island Airport, which he submitted would result in no impact to circuit procedures at the Bow Island Airport and would leave as many options as possible available to flight crews to co-ordinate during takeoffs, departures, arrivals, and landings. N. Hofmann added that this would be a huge step in the right direction towards finding operational harmony and safety between aviation utilization and wind power.[108]

108. The Commission does not agree that such an "outer surface" should be adopted nor that adopting such an "outer surface" would ensure aviation safety in every instance of a wind power plant located near an aerodrome. Instead, the Commission maintains the view that aviation safety impacts should be assessed in the context of each specific application before it. Additionally, the Commission notes that there is no support for N. Hofmann's proposed "outer surface" in the federal aviation regulatory regime. As discussed in Section 4.1.2.1, an outer surface is no longer

[102] Transcript, Volume 5, pages 670-671.
[103] Exhibit 27561-X0278, N Hofmann Information Response to RES, page 28 and Exhibit 27561-X0285, Item #7-Type Certificate Data Sheet A-91.
[104] Transcript, Volume 6, page 819, lines 3-6.
[105] Exhibit 27561-X0085, Flight Safety Impact - Aerial Application, PDF page 2.
[106] Exhibit 27561-X0261 – Exhibit 27561-X0265.
[107] Transcript, Volume 6, page 832, lines 6-8.
[108] Exhibit 27561-X0249, Nathan Hofmann's answers to AUC questions, PDF pages 53-58.

an obstacle limitation surface, and is now an obstacle identification surface. Further, while an obstacle clearance circle extends to a radius of five nautical miles, an outer surface only extends to a radius of 4,000 metres.

109. The Commission accepts that the circuit flown by an aircraft depends up on many circumstances, including weather and the type, weight and speed of an aircraft. The Commission acknowledges that pilots have to consider the affected turbine structures and other obstacles when completing circuits, and that Top Crop's pilots may have to change their current flight routes in order fly around the amended project. However, the Commission also notes that Top Crop's pilots typically only fly a portion of the circuit, mainly on takeoff and landing. Based on the foregoing, the Commission finds that the affected turbine structures are unlikely to create an unacceptable hazard within the circuits flown at the Bow Island Airport.

4.2.4 Conclusion regarding the aviation safety impacts of affected turbines structures

110. Given the above, the Commission finds that any impacts to aviation safety at the Bow Island Airport due to the affected turbine structures will likely be minimal.

4.3 Will wake turbulence from the affected turbines impact the safety of aviation operations at the Bow Island Airport?

111. The wake characteristics of a wind turbine are created by the interaction between the blade and the air. In particular, the thrust produced by the spinning rotor disrupts the airflow, causing it to slow down (called the velocity deficit) and produce increases in turbulence intensity.[109] In this decision, the Commission generally refers to the wind effects caused by turbines as wake turbulence.

112. N. Hofmann raised concerns about the effects of wake turbulence on Top Crop's aircraft operating in and around the Bow Island Airport. To respond to these concerns, AECG retained Dr. Rogers of Persimia LLC who submitted reports on aviation risk from wake turbulence as a result of the amended project. Both N. Hofmann and Dr. Rogers submitted evidence related to wind turbine wakes. Dr. Rogers completed a wake encounter simulation study, and N. Hofmann provided evidence related to his flying experience. The parties generally disagreed on the distances and intensities at which an aircraft would experience wake turbulence from the amended project's wind turbines, including whether wake turbulence would have an effect on aerial spraying aircraft arriving and departing from the Bow Island Airport.

4.3.1 How has N. Hofmann experienced turbulence when flying near wind turbines?

113. N. Hofmann testified that based on his experience flying around turbines, wake turbulence can affect flight and be unsafe. N. Hofmann stated that wind turbines create a very unique form of turbulence, similar to the wake caused behind a boat propeller in the water. He indicated that turbulence could cause an aircraft to become uncontrollable, but it would be hard to identify the probability of this, as the presence of operating wind turbines (upwind) would force the aerial applicator to avoid them entirely. N. Hofmann added that Top Crop's exposure to turbulence from the amended project would be greatest when the runway, or arrival and departure paths to the runway, are downwind of the amended project.

[109] Exhibit 27561-X0244, RES Response to AUC IR 3.

114. N. Hofmann explained that based on his experience, turbulence can be experienced while flying at up to three to five miles from operating turbines[110] but that it is hard to put a definite line on the distance as it depends on other variables, such as the atmospheric conditions. He said that he initially felt comfortable attempting flying in proximity to a wind farm, but determined it was no longer safe based on the conditions he experienced within three miles of the wind farm.[111] N. Hofmann later testified that he would often be comfortable flying at a distance of two to three miles from a wind farm on the basis that his flight would not be disturbed by wind farm related turbulence, but it depended on the circumstances.[112]

115. AECG suggested N. Hofmann's characterization of his experience flying in proximity to wind turbines was inconsistent. AECG pointed to Top Crop's standard operating procedure which states that:

> Top Crop Applicators Inc. will require a two-mile setback from "field edge" to "turbine base" to "guarantee" our service. Applications within the two-mile setback will be assessed by the Chief Pilot before the order is accepted.[113]

116. AECG suggested that this document showed that N. Hofmann's characterization of the distance at which he can experience turbulence from turbines had been inconsistent, because it indicates that he is able to operate at a distance much closer than three to five miles from a turbine.[114] However, N. Hofmann explained that if he was conducting a mission within close proximity to wind turbines as contemplated by his standard operating procedure, the turbines would have to be paused.[115] Conversely, D. Francoeur testified that while he does not have direct aerial spray application experience, he has also taken off in and around some southern Alberta airports with turbines operating at an estimated distance of one or two kilometres away.[116] The Commission accepts this evidence, but finds it has little relevance to the issues raised by N. Hofmann about the operation of his particular aircraft in the conduct of aerial spraying operations from the Bow Island Airport – which involves unique considerations such as overweight takeoffs and landings.

117. The Commission finds that N. Hofmann is a credible witness. While in some circumstances, N. Hofmann provided different numbers as to the exact point at which he may form the opinion that it is unsafe to fly in proximity to an operating turbine, he explained that this is because this determination depended on a variety of factors, including general atmospheric turbulence. The Commission accepts N. Hofmann's evidence as to his personal experience flying in proximity to wind turbines.

118. However, having accepted N. Hofmann's evidence as to his personal experience flying near wind turbines, the Commission finds that there is some difficulty in drawing inferences from that evidence to determine whether any of the wind turbines associated with the amended project are sited too close to the Bow Island Airport. As N. Hofmann himself explained, his safety assessments regarding the distances at which he is comfortable flying in proximity to operating wind turbines depend on a variety of factors, including atmospheric conditions.

[110] Transcript, Volume 6, page 823.
[111] Transcript, Volume 6, page 822 – 823.
[112] Transcript, Volume 6, pages 836-837.
[113] Exhibit 27561-X0109, Stand Operating Procedure.
[114] Transcript, Volume 7, page 944, lines 12-14.
[115] Transcript, Volume 6, page 835, lines 15-21.
[116] Transcript, Volume 5, page 650, lines 12-25.

Understandably, N. Hofmann was not able to provide the exact atmospheric conditions, and precise distances, at which this turbulence would lead him to make the decision that it was unsafe to fly. Therefore, while the Commission accepts N. Hofmann's evidence regarding his personal experiences flying near turbines, the Commission is unable to extrapolate from that evidence the distance at which the relevant turbines should be sited from the Bow Island Airport. For example, it may be possible that N. Hofmann experienced turbulence at three to five miles from a wind turbine, in atmospheric conditions that would never arise from the amended project when a pilot is using the Bow Island Airport.

119. The Commission finds that wake turbulence is a factor that pilots may have to consider when flying near a turbine, and will assess this further below.

4.3.2 What evidence was submitted by Dr. Rogers?

120. Dr. Rogers provided analysis of wake turbulence in this proceeding through several methods. These methods include:

- A review of existing literature on the topic of wind turbine wakes and their impacts on aircraft.
- A review of existing historical data regarding airports near operating wind turbines, and accidents.
- A wake encounter simulation study that simulated over 600 wake encounters by an aerial sprayer in relation to an individual turbine.
- A wake simulation of all 22 affected turbines, in one specific scenario in which the wind will cause wakes from the amended project to propagate in the direction of the Bow Island Airport.

121. Each of these components of Dr. Rogers's evidence is assessed in sequence in the following subsections.

4.3.2.1 What were Dr. Rogers's conclusions from the existing literature?

122. In Dr. Rogers's report, he included a section titled "Analysis of Archival Literature." In this section, Dr. Rogers explained that he had conducted a comprehensive literature survey on the topic of wind turbine wakes and their potential impacts on aircraft, and identified eight articles that he viewed as relevant.[117] Dr. Rogers then analyzed these articles, and performed a risk assessment in respect of the amended project based on this analysis.[118]

123. Dr. Rogers submitted that flight operations at the Bow Island Airport would not be affected in any noticeable way by wind turbine wakes due to wake dissipation and that studies using high fidelity simulation models and experimental data showed that the velocity deficit and turbulence caused by spinning wind turbine rotors is confined to an area that extends less than

[117] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 8.

[118] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 15.

10 rotor diameters downwind of a turbine.[119] Dr. Rogers stated that the literature suggests that even if general aviation aircraft do fly within 10 rotor diameters of a turbine, any perturbations to the aircraft attitude would be easily corrected by the pilot. Dr. Rogers added that given there is 26 rotor diameters distance between Bow Island Airport and the nearest turbine, pilots are unlikely to notice any affects at all from wind turbine wakes.[120]

124. Dr. Rogers stated that based on his review of the relevant peer-reviewed literature, there is no safety risk posed by general aviation wake encounters at the distances planned for the project. Dr. Rogers further stated that none of these studies identified flight disturbances large enough to pose a safety risk to the aircraft.

125. N. Hofmann raised concerns with some of the studies relied on by Dr. Rogers in his evidence. During the hearing, N. Hofmann's representative put questions to Dr. Rogers regarding the applicability of these studies. Specifically, these questions were related to distinctions between the subject matter of these studies, to the extent they relied on data from helicopters as opposed to comparable planes and offshore turbines, as opposed to overland turbines. Dr. Rogers explained that while some of these distinctions were valid, his opinion remained that the general aerodynamic forces explored in these studies were sufficiently similar to those at issue in this proceeding, that it was reasonable for him to reach the conclusions in his report regarding flight safety.[121]

126. During the hearing, Dr. Rogers was also presented with a document in which one of the authors of a study he relied on, which will be referred to as the Varriale Study,[122] made comments regarding the applicability of that study. Dr. Rogers acknowledged that one of the authors had cautioned against putting wind turbines within 20 rotor diameters of an airstrip, and stated that while he did not necessarily discount these comments, they were not made in the context of a peer-reviewed study, and so less weight should be placed on these comments as compared to the study itself.[123]

127. In response to a question from the Panel Chair, Dr. Rogers explained that after he had completed his simulation, as explained below, he compared his results to the studies in his literature review and found that it matched very well. Dr. Rogers testified that:

> They use a different -- a slightly different formulation of the aircraft model or a different way of modelling the wake. And so we've used these different methods of modelling, and we've come up with very similar answers, and that's one way in the engineering community that we -- that we corroborate our results and have confidence in them.[124]

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[119] The rotor diameter for the amended project's turbines would be 155 metres. 10 rotor diameters would be 1,550 metres.

[120] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 5.

[121] Transcript, Volume 5, pages 698-708.

[122] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 8: C. Varriale, A. De Marco, E. Daniele, J. Schmidt, B. Stoevesandt, "Flight Load Assessment for Light Aircraft Landing Trajectories in Windy Atmosphere and Near Wind Farms," Aerospace, Vol. 5, No. 42, 2018.

[123] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, page 96.

[124] Transcript, Volume 5, page 795, lines 4-11.

128. As explained in Section 3.3, the Commission may place weight on the opinions of a qualified expert as to the consensus, or lack thereof, within a body of scientific literature, where that opinion is formed on the basis of a sufficiently transparent and systematic review of the relevant studies. The Commission may also place weight on the opinion of a qualified expert as to how this consensus applies to a project it is considering.

129. The Commission is satisfied that the literature review completed by Dr. Rogers was sufficiently systematic and transparent, but the Commission places somewhat limited weight on this evidence, as the studies considered circumstances that differ from the circumstances of the project in many ways. For example, the Commission considers that this evidence is relevant to the extent it corroborates Dr. Rogers's simulation results, but would not be prepared to accept this evidence as sufficient to establish the aviation safety impacts of the amended project independently.

4.3.2.2 What were Dr. Rogers's conclusions about the historical data?

130. Dr. Rogers also completed a review of historical data and stated that the setback distances between the amended project's turbines and the Bow Island Airport would be consistent with setbacks used from turbines to airports at hundreds of existing wind farms in North America. Dr. Rogers indicated that thousands of general aviation aircraft flights are performed every day in the United States at airports within four kilometres of an operating wind turbine without incident from wake turbulence.[125] During the hearing, Dr. Rogers explained that while anecdotal evidence of this nature was not a scientific way to generate a conclusion, it is evidence that can be considered to support conclusions that were generated scientifically.[126]

131. The Commission finds that this evidence has limited relevance to the extent it supports the conclusions of Dr. Rogers's simulation study and literature review, and places little weight on it considering the inherent limitations of anecdotal evidence of this nature.

4.3.2.3 Wake encounter simulation study

132. Dr. Rogers conducted an aircraft wake encounter simulation study (simulation study) that involved developing a simulation software model for the flight of the Grumman G-164 Ag Cat aircraft, similar to that operated by Top Crop through a wind turbine wake. This simulation software was used to simulate wake encounters by an aerial applicator aircraft along different flight paths.[127] Dr. Rogers stated that over 600 aircraft wake encounters were simulated in the study using different flight paths, altitudes, gross weights, airspeeds, and ambient wind and turbulence conditions. This included modelling the Ag Cat aircraft in operations above maximum gross weight.

133. Dr. Rogers's simulation study showed that turbine-added turbulence affects the aircraft by causing flight perturbations; however, these disturbances would be similar to those caused by routine atmospheric turbulence. Dr. Rogers observed that none of the simulated wake encounters yielded flight disturbances large enough to pose a safety risk to the aircraft. Based on the simulations performed, Dr. Rogers submitted that the amended project's setbacks from

[125] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 5.
[126] Transcript, Volume 5, page 788, lines 5-15.
[127] Exhibit 27561-X0237, Appendix B – Expert Report and Curriculum Vitae of Dr. Jonathon Rogers of Persimia, LLC, PDF page 3.

Bow Island Airport provided sufficient separation to protect Top Crop's aircraft from any hazards caused by wind turbine wakes when operating from the aerodrome.

134. Dr. Rogers's simulation study showed that at distances farther than 10 rotor diameters from a turbine, the aircraft perturbations experienced in the turbine wake were of similar magnitude to those experienced in light atmospheric turbulence, and may not be noticeable to the pilot except in smooth air. Dr. Rogers stated that at distances of 20 rotor diameters from a turbine and beyond, the turbulent perturbations in the wake would be extremely small and unlikely to be noticed by the pilot in any conditions.

135. Dr. Rogers concluded that the amended project would not pose a risk to general aviation or aerial applicator aircraft, and would not noticeably affect aircraft stability, control, or handling qualities. Dr. Rogers added that the distances between the nearest turbines and the Bow Island Airport would be sufficiently large to ensure that the turbine wakes would dissipate before they reach aircraft operating in the aerodrome traffic pattern.

136. N. Hofmann remarked that Dr. Rogers has no experience flying around wind turbines or flying aerial spray planes and that Dr. Rogers's understanding of spray plane flight parameters and capabilities was lacking. N. Hofmann raised concerns that the simulation study ran selective simulations and that it did not reflect climbing, banking, and descending manoeuvres that Top Crop's aircraft use. N. Hofmann critiqued Dr. Rogers's simulation study because it did not simulate more than one turbine and it assumed a constant altitude.

137. The Commission accepts Dr. Rogers's evidence on the existence and characteristics of wakes created by wind turbines, and that wake turbulence intensity generally decreases as distance increases from the turbine. The evidence provided by Dr. Rogers showed a thorough study of wake turbulence regarding the amended project's impacts to the Bow Island Airport and concluded that any wake turbulence created as a result of the amended project's wind turbines would not cause imminent danger to aircraft operating out of the Bow Island Airport for the designed dominant wind conditions for the project.

4.3.2.4 Wake simulation of all 22 turbines

138. N. Hofmann also questioned the potential for winds coming from the southeast, and whether it would boost the wind turbine wakes from any upstream turbines that would be in the southeast before the wind gets to the Bow Island Airport.

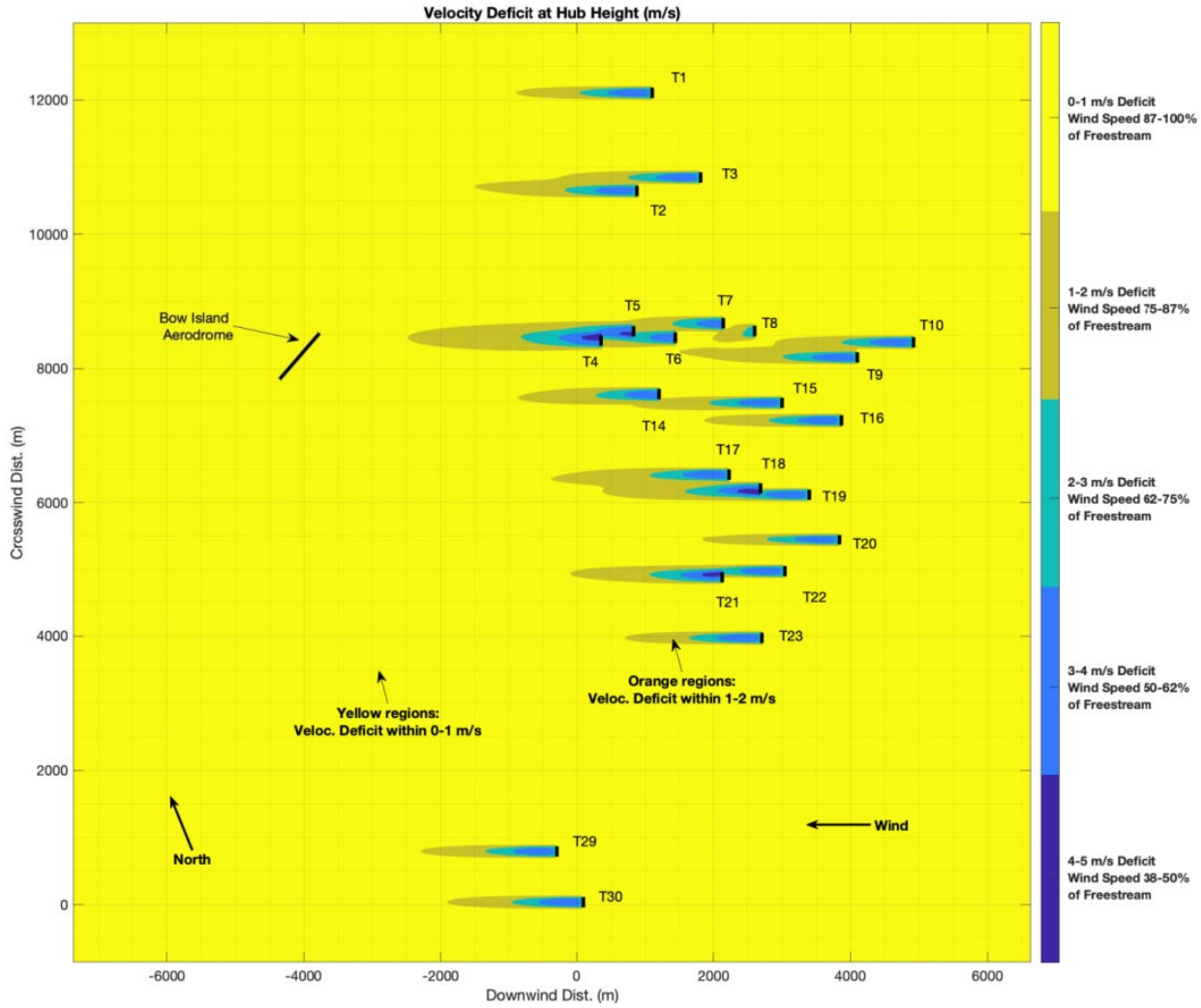
139. In response, Dr. Rogers stated that multiple wakes boosting each other is not a phenomena that is usually apparent. He testified that when there are multiple wakes in a row interacting, there are small regions where the wind speed may go faster in between rows of turbines, but downstream of the wind farm there would not be overspeed zones because there is plenty of ambient air mass to fill the air behind that area.

140. Dr. Rogers filed a wake simulation he performed of all 22 turbines within five nautical miles of the Bow Island Airport. This simulation considered what was described as a notational worst-case scenario, based on the following conditions:

- Wind blowing from the southeast towards the Bow Island Airport at a heading of 110 degrees (the direction in which the wake from the closest turbine, T4, would be propagating towards the Bow Island Airport.
- A wind speed of eight metres per second (based on N. Hofmann's claims this was the wind speed under which turbulence will be maximized).
- An ambulant turbulence intensity of 12 per cent.

141. This simulation produced the following figure:

Figure 2. Wake simulation of 22 turbines, based on "worst-case" scenario conditions[128]



[128] Exhibit 27561-X0290, Appendix B – Expert Report Reply of Dr. Jonathon Rogers of Persimia, LLC, PDF page 15.

142. Dr. Rogers noted that it was relatively rare for the wind to travel at a 110-degree heading at the Bow Island Airport, and that the wind only blew within 15 degrees of that heading in either direction approximately five to six per cent of the year, with the wind blowing in the opposite direction (such that wakes would propagate away from the aerodrome) approximately 90 per cent of the time.[129]

143. AECG argued that Dr. Rogers's simulation study of combined wake effects from all affected turbines was conducted for a worst-case southeast wind and that even the worst-case turbine wakes do not extend sufficiently far to impact operations at the Bow Island Airport.

144. The Commission accepts the accuracy of this simulation, and that it is relevant to the concerns raised by N. Hofmann about winds coming from the southeast, but does not accept that it is sufficient to establish turbine wakes will not impact operations at the Bow Island Airport. First, the Commission notes that this simulation corroborates the potential for additive wake effects. For example, the wake propagated from a stand-alone turbine such as Turbine T30 extends approximately 2,000 metres, whereas the wake propagated from Turbine T4, apparently as a consequence of additive wake effects, extends approximately 2,900 metres. Second, the Commission notes that unlike the more extensive wake encounter simulation study involving single turbines, this simulation only considered additive effects in relation to one unique set of atmospheric conditions, leaving some uncertainty as to how additive effects may operate in other circumstances.

4.3.3 Conclusion regarding safety impacts of wake turbulence

145. The Commission has accepted N. Hofmann's submission that he has experienced wake turbulence that poses safety risks when flying near turbines. The Commission has also accepted Dr. Rogers's submission that the amended project would not cause imminent danger as a result of wake effects – in the sense of causing aircraft structural failure, or generating forces that may cause a pilot to be unable to control the aircraft. In this section, the Commission will consider this evidence regarding wake turbulence in relation to the specific circumstances of the amended project, and in particular the distances between the amended project's turbine and the Bow Island Airport.

146. As noted above, the Commission accepts that Dr. Rogers provided a literature review, an analysis of historical data, and a wake encounter simulation study and generally accepted his conclusions. For this reason, in this section of the decision the Commission generally relies on Dr. Rogers's evidence regarding the distances from which wake turbulence may propagate from the amended project's turbines, and the impact of that turbulence to aircraft at specific distances.

147. However, as the Commission also noted above, there is some uncertainty in this proceeding regarding the possible additive effects of the interaction of multiple turbine wakes. In particular, the evidence shows that when wind is travelling at a heading of approximately 110 degrees, it is likely that this additive effect will result in a greater level of wake turbulence extending from the amended project, towards the Bow Island Airport, than will generally be the case for the stand-alone turbine that was the subject of Dr. Rogers's more extensive wake encounter simulation study. Based on this evidence, the Commission finds that this amplified wake effect is unlikely to result in a categorically different wake turbulence effect that would

[129] Exhibit 27561-X0290, Appendix B – Expert Report Reply of Dr. Jonathon Rogers of Persimia, LLC, PDF pages 13-14.

typically emanate from a single turbine, but that there is likely to be an amplification effect, and the exact extent of this effect in different wind and atmospheric conditions is unknown.

148. The locations of the turbines included in the amended project within five nautical miles of the Bow Island Airport are depicted in the diagram in Appendix D, which was provided by Tetra Tech in response to an information request from N. Hofmann. In the diagram:

- The Bow Island Airport is circled by:
    i. A blue dotted line depicting a radius of four kilometres. This corresponds to the outside of the outer obstacle limitation surface as defined in the TP312 4th edition and TP1247, and the outer obstacle identification surface as defined in TP312 5th edition.
    ii. A red dotted line depicting a radius of 9.26 kilometres (five nautical miles – the obstacle clearance circle as defined in the Canada Flight Supplement).
- Each turbine is circled by:
    i. A purple dotted line depicting a radius of 1.55 kilometres (10 rotor diameters).
    ii. A black dotted line depicting a radius of 3.10 kilometres (20 rotor diameters).
- A representative aircraft circuit from the Bow Island Airport is depicted in orange.

149. In Section 4.1, the Commission recognized that a four-kilometre obstacle identification surface may be provided for the purposes of identifying obstacles that require assessment as part of airspace protection for aircraft maneuvering in the vicinity of an aerodrome. While the four-kilometre radius is not definitive, the Commission considers that this distance is recognized as having significance in the obstacle management analysis contemplated by the Transport Canada documents. This is consistent with the Commission's past decisions regarding the four-kilometre radius.[130] The significance of the four-kilometre radius is also recognized in Rule 007. For example, maps of a proposed wind power plant must show any registered aerodromes, and any known unregistered aerodromes within four kilometres of a proposed turbine location.[131] While the Commission recognizes this distance is somewhat arbitrary, the Commission considers that the four-kilometre zone is a reasonable benchmark, within which to apply a heightened level of precaution with respect to aviation safety risks – including wake turbulence.

150. The Commission understands that the wake turbulence intensities found at zero to 10 rotor diameters (0 kilometres to 1.55 kilometres) from turbines may be present within four kilometres of the Bow Island Airport as a result of Turbine T4 in certain conditions when the wind is blowing from the southeast. Further, wake turbulence from Turbine T5 may be present just beyond four kilometres from the Bow Island Airport at a similar intensity. Dr. Rogers testified that the wake turbulence intensity within zero to five rotor diameters would produce noticeable perturbations, but would not approach aircraft safety limits.[132] Dr. Rogers

[130] Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023, paragraphs 85, 86.
[131] Rule 007, 4.3.2, WP6(ii).
[132] Transcript, Volume 5, page 739, lines 9-17.

added that wake turbulence intensity within five to ten rotor diameters might be felt, but would not affect N. Hofmann's rates of climb more than typical ambient turbulence would.[133]

151. The Commission acknowledges that under certain conditions when wind is blowing from the southeast, turbines T4 and T5 may produce a wake that could extend into the four-kilometre radius, when aerial applicators are conducting operations at the Bow Island Airport. The Commission also notes that when the wind is travelling at a heading of approximately 110 degrees at a sufficient speed, the wakes of turbines T4 and T5 are likely to interact, and cause an amplification of the level of turbulence that would generally be propagated by either turbine independently. Based on the evidence in this proceeding, the Commission finds it is this additive effect that is likely to cause the most extensive penetration of wake turbulence into the four-kilometre radius, and that the exact nature and degree of penetration in different atmospheric and wind conditions is somewhat uncertain.

152. Dr. Rogers submitted that at distances between 10 and 20 rotor diameters from a turbine (1.55 kilometres to 3.1 kilometres), the aircraft perturbations experienced in the turbine wake were of similar magnitude to those experienced in light atmospheric turbulence, and may not be noticeable to the pilot except in smooth air. The Commission accepts this evidence, and notes that with the exception of turbines T4 and T5, all other turbines are located near the end of that range from the four-kilometre radius, or farther. Accordingly, the Commission finds it is not necessary to consider safety impacts with respect to turbines other than turbines T4 and T5 further in this decision.

153. In conclusion, based on the proximity of turbines T4 and T5 to the four-kilometre radius, and the evidence regarding the potential amplification of the wakes from these turbines in certain wind conditions, the Commission finds that it is necessary to consider the wake turbulence from these turbines from a risk analysis perspective. With respect to all other turbines, the Commission is satisfied that their distance from the four-kilometre radius is sufficient to ensure that any wake turbulence they produce will not create physical forces within the four-kilometre radius. Accordingly, wake turbulence from these turbines will not be considered in Section 4.4 of this decision below.

4.4 Will the aviation safety impacts of the affected turbines increase risk at the Bow Island Airport to an unacceptable degree?

154. As explained in Section 3.2, the Commission may consider, in light of existing circumstances, whether the amended project compounds the practical and operational risks faced by pilots, such that the project results in unacceptable aviation safety impacts. In this section of the decision, the Commission performs this analysis. The Commission begins by considering the risk assessments provided by different witnesses, and then makes conclusions regarding aviation safety risk.

[133] Transcript, Volume 5, page 754, lines 1-7.

4.4.1 Risk assessment evidence

4.4.1.1 Tetra Tech's risk analysis

155. Tetra Tech provided a qualitative risk assessment to identify hazards that may impact aerial application flight operations including takeoff and departure; approach and landing; as well as the use of circuits at the Bow Island Airport.

156. Tetra Tech defined hazards in its risk assessment as conditions that exist in the system that can lead to injury, illness, or death to people; damage to or loss of a system, equipment, or property; or damage to the environment. It added that a hazard must exist to be classified as a hazard and the lack of something cannot be classified as a hazard.

157. Tetra Tech defined risks in its risk assessment as the potential adverse consequence or result associated with a particular hazard. It submitted that there is often more than one risk associated with a particular hazard.

158. Tetra Tech included a hazard identification and risk assessment table which, in its opinion, indicated that potential risks from the presence of the amended project would be low in all circumstances. Tetra Tech submitted that the hazard identification and risk assessment table was based on worst credible outcomes and added that though risk tolerance is operator and organization specific, the preparation of the hazard identification and risk assessment table was guided by advice promulgated by Transport Canada, the Federal Aviation Administration in the United States, and the International Civil Aviation Organization.[134]

159. More generally, Tetra Tech stated that aircraft operators, no matter what aviation activity, are responsible to account for operational factors as they prepare for their flight, to ensure safe completion and the operational profile includes but may not be limited to formulating a plan that accounts for aircraft performance, altitude, fuel, wind and weather (actual/forecast), and flying the aircraft. Tetra Tech also stated that operations preparation includes conducting pre-flight checks, collaborating with those assisting on the ground and ensuring the rules governing aircraft operations will be adhered to.

160. Tetra Tech further stated that aircraft operators must also be aware of changes to the aerodrome and surroundings so that these changes may be factored into planning for an aircraft operation (departure or arrival), which could include new obstacles in the vicinity of an aerodrome. In the case of the structures planned for the amended project, Tetra Tech indicated that this would mean knowledge of the location and dimensions of the turbines, as well as their lighting. Tetra Tech maintained that the aircraft operator would be responsible, with this knowledge, to see and avoid the obstacles while in flight, as they do for all other obstacles.

161. If the amended project were to be constructed, Tetra Tech submitted that the responsibility for safe operations in various conditions resides entirely with the pilot, assuming that the initial safety margin for aircraft operators provided in the regulations and in Transport Canada's standards are met. It added that establishing that safety margin is the pilot's

[134] Exhibit 27561-X0236, Appendix A – Expert Report Addendum of Shawn Sutherland and Doug Francoeur of Tetra Tech and Curricu, PDF page 7 explained that it was guided by Transport Canada (Advisory Circular No. 107-001 Guidance on Aviation Safety Management System (SMS) Development); the Federal Aviation Administration in the USA (FAA Advisory Circular 150/5200-37A - SMS for Airports); and the International Civil Aviation Organization (ICAO Doc 9859 AN/474 SMS Chapter 5 – Safety Risks).

responsibility, based on their risk tolerance, and that issues such as increased wear and tear and the need for more frequent aircraft inspections, are only economic issues, not flight safety issues.

162. Tetra Tech concluded that flight safety impacts in minimal visual flight rule conditions for aircraft departure and arrival operations would not be very different from what they are today. It emphasized that pilot responsibilities would remain unchanged, including that pilots must: be aware of obstacles in the vicinity of the aerodrome, confirm the weather conditions (actual/forecast) and aircraft performance characteristics before going to or from the Bow Island Airport. Tetra Tech stressed that aviation safety includes both the safety of aircraft operations and the safety of aerodromes being used for aircraft takeoff and landing.

4.4.1.2 Dr. Rogers's risk analysis

163. Dr. Rogers's risk analysis suggested that safety of the aircraft was related to flight conditions that either resulted in structural integrity limits being exceeded, or disturbances to flight that were severe enough to result in a loss of controlled flight or difficulty maintaining controlled flight.

164. Dr. Rogers also stated that at a distance farther than 10 rotor diameters from the turbine, aircraft perturbations were similar to "light atmospheric turbulence," and that at a distance farther than 20 rotor diameters "turbulent perturbations in the wake are extremely small and unlikely to be noticed by the pilot in any conditions."[135] This was based in Dr. Rogers's simulation study involving single wind turbines and aircraft encounters with wake turbulence.

165. Ultimately, Dr. Rogers concluded that the setback between the amended project and the Bow Island Airport was adequate, and that it would provide sufficient separation to ensure N. Hofmann's aircraft would be protected from any hazards caused by wake turbulence when using the Bow Island Airport or operating in the proximate area.

4.4.1.3 N. Hofmann's risk analysis

166. N. Hofmann referenced the Transport Canada publication TP13897 *Pilot Decision Making*[136] (TP13897) as the foundation for a quantitative analysis on how the amended project could cause an increased risk to aerial application around the Bow Island Airport. N. Hofmann's risk analysis used a formula from the Pilot Decision Making document:

$$R = P \times C \times E$$

R = Risk P = Probability C = Consequence E = Exposure

167. Guidance from the TP13897 document was used to apply a number to each item in the formula, whereby N. Hofmann identified each hazard, being defined as something that can cause harm.

168. N. Hofmann's risk analysis concluded that aerial applicators would be more exposed to reduced airspace due to the frequency of airport usage and the number of arrivals and departures required to conduct missions. N. Hofmann stated that this hazard would also be affected by the number and type of aircraft using the airport.

[135] Exhibit 27561-X0276, RES Aircraft Wake Encounter Simulation Study, PDF page 5.
[136] Exhibit 27561-X0257, Attachment #8 - Transport Canada Risk Management - TP 13897.

169. As part of his analysis, N. Hofmann concluded that the consequences to an uncontrollable aircraft due to turbine wake turbulence would be severe.

170. With respect to disorientation and distraction, N. Hofmann noted that aerial applications are conducted with visual reference and situational awareness to the horizon and stated that under normal circumstances, loss of visual reference will result in the death of the pilot. N. Hofmann submitted that factors that add to disorientation and distraction include low visibility conditions, which creates a hazy undefined horizon, and that large turning blades further would confuse the horizon and compound the risks. N. Hofmann stated that another factor to compound the risk of disorientation and distraction are low ceilings, which negate the possibility or option of safely maneuvering the aircraft over top of the wind power plant and force the aircraft to stay low amongst wind turbines, which increases the hazard.

171. With respect to the frequency of airport use, N. Hofmann stated that Top Crop has high usage of the Bow Island Airport, indicating that during the busiest days Top Crop could do over 30 flights,[137] and because of this, it would have a higher exposure, which therefore increased the total risk criteria.

172. N. Hofmann's analysis also suggested that the lack of guidance from Transport Canada and NAV Canada from a regulatory standpoint is confusing, which would cause an indirect impact. Similarly, N. Hofmann stated that the Commission's decisions would have an indirect impact since the current stakeholder process does not effectively engage the aerial application industry.

173. Upon completing his risk assessment, N. Hofmann deemed the project to be high risk.[138] N. Hofmann stated that the biggest problem is that the aerial applicator cannot assess these risks one at a time because the risks can often be present all at the same time.[139]

174. More generally, N. Hofmann submitted that the proximity of the wind turbines would cause pilot distraction, disorientation, and spatial disorientation. N. Hofmann explained situations where the brain can be completely overloaded and a pilot loses their entire sense of situational awareness to the point that they cannot make a decision. N. Hofmann suggested that this can occur more frequently in low-level flight because there are so many items to keep track of, and the risk increases the lower an aircraft flies with respect to the ground. N. Hofmann also emphasized the importance of situational awareness to a pilot, and in response to a question on the topic, N. Hofmann stated:

> It's the biggest -- biggest part of low-level flight. If you look at any -- I think you could study at length any accident scenario in the lower flight levels that -- that resulted in a contact with terrain or an obstacle, and you'll probably find that the pilot lost situational awareness. There's so much to keep track of. And the lower you are to the ground, the more those things can come up and bite you.[140]

175. In summary, N. Hofmann's position regarding risk and safety is that while expert assessments were useful, the assessments provided in this proceeding failed to consider the

[137] Transcript, Volume 6, page 816.
[138] Exhibit 27561-X0249, Nathan Hofmann's answers to AUC questions, PDF page 18.
[139] Exhibit 27561-X0249, Nathan Hofmann's answers to AUC questions, PDF page 13.
[140] Transcript, Volume 6, pages 850-851.

practical operational challenges faced by pilots, and the many diverse factors that need to be considered while operating an aerial application aircraft.

4.4.2 Conclusion regarding aviation safety risk

176. In this section, the Commission will assess whether the aviation safety impacts of the affected turbines will increase risk at the Bow Island Airport to an unacceptable degree, with consideration to the evidence and risk assessments discussed above. As noted in Section 3.2, the construction of any wind turbine in the vicinity of an aerodrome imposes some finite amount of risk in relation to operations at the aerodrome because it creates an obstacle that would otherwise not be there. The Commission's role is to determine whether adverse safety risks associated with the amended project are reasonable in the circumstances, and are proportionate to the benefits of the project.

177. With respect to the reasonableness of the adverse safety risks associated with the affected turbines, the Commission recognizes that there are differing views of the amount of risk presented by the amended project, as shown by the differing results in the analysis completed by Tetra Tech, Dr. Rogers, and N. Hofmann. The Commission understands these differences may be a consequence of the inevitability that different people and pilots would approach the assessment from different perspectives, applying different methodologies, and based on different thresholds for levels of acceptable risk. In the Commission's view, there is no one correct safety assessment and the role of the Commission is not to accept or reject these assessments, but to consider them as guidance in respect of its own assessment of safety impacts.

178. However, the Commission accepts N. Hofmann's evidence to the effect that the operation of aircraft involves the simultaneous assessment of many different factors, and that in a particular set of circumstances, the addition of one more risk factor may result in the inability of a pilot make the decisions necessary to safely operate the aircraft. In this way, the addition of one further factor may impair a pilot's ability to safely operate. For this reason, the Commission will consider impacts to safety from this perspective, having regard to how the amended project compounds operational challenges, in light of its other findings in respect of the amended project.

179. In Section 4.1, the Commission found that the amended project complied with the relevant federal regulatory regime. As part of its risk assessment, Tetra Tech submitted that the *Canadian Aviation Regulations* and Transport Canada's standards provide the initial safety margin for aircraft operators, as it relates to both the aircraft and how it is to be operated. However, N. Hofmann suggested that a greater margin of safety is required beyond the current regulations because aircraft, and the people that operate them, have limitations. N. Hofmann stated that as wind turbines are increasing in height and rotor swept area, the risk to aircraft and aerodromes is increasing. The Commission considers that compliance with the federal aviation regulatory regime is a starting point to the Commission's assessment of aviation safety, but is not determinative in this proceeding.

180. In Section 4.2, the Commission found that any impacts to aviation safety at the Bow Island Airport due to the affected turbine structures will likely be minimal. While the Commission recognizes that the affected turbine structures are something that pilots would have to consider when flying in the general area of the amended project, it reiterates that the assessment of aviation safety in this decision concerns the safety of aircraft operations when arriving at and departing the Bow Island Airport.

181. Similarly, in Section 4.3 the Commission accepted Dr. Rogers's evidence that concluded that any wake turbulence created as a result of the project wind turbines would not cause imminent danger to aircraft operating out of the Bow Island Airport but the Commission also concluded that wake turbulence impacts will generally only impact the safety of operations at the Bow Island Airport, if the wake turbulence is perceptible within four kilometres of the Bow Island Airport. This can only be the case when wind is blowing from the southeast, and the only turbines that may cause such an impact are turbines T4 and T5, due to their proximity to the four-kilometre zone, and the potential for their wakes to interact in a way that amplifies the effects typical of a single turbine. For this reason, the Commission concluded wake turbulence from these turbines could impact a pilot's ability to safely operate an aircraft when conducting operations at the Bow Island Airport. This is particularly the case for aerial spray pilots, operating in over maximum gross weight conditions, with an impaired ability to climb.

182. Given the above, the Commission accepts the views of N. Hofmann that risk should be assessed based on various factors that may impact a pilot's ability to safely operate an aircraft. The Commission finds that the amended project will create some increase to aviation safety risk, based on N. Hofmann's explanation of the effects of turbines on aviation operations. The Commission accepts that wake turbulence from wind turbines, is one such factor. However, the Commission is satisfied that, with the exception of those turbines that may cast perceptible wake turbulence within four kilometres of the Bow Island Airport (turbines T4 and T5), the increase to aviation safety risk that the amended project poses in respect of the Bow Island Airport is reasonable, and therefore, does not need to be further mitigated. The Commission finds that the approval of all affected turbines, other than turbines T4 and T5, is in the public interest for the reasons set out in this decision, and in Decision 27561-D01-2023.

183. With respect to turbines T4 and T5, the Commission considers that since these turbines may cast sufficient wake turbulence to impact a pilot's ability to safely operate an aircraft when conducting operations at the Bow Island Airport, especially when operating in overweight conditions and adverse weather. The Commission finds that turbines T4 and T5 have the potential to increase aviation safety risk at the Bow Island Airport to an unacceptable degree.

184. In the next section, the Commission will consider whether the unreasonable increase to aviation safety risk posed by turbines T4 and T5 can be adequately mitigated.

4.4.3 Can the unreasonable increase to aviation safety risks be adequately mitigated?

185. As the Commission has found that turbines T4 and T5 may increase aviation safety risk at the Bow Island Airport to an unacceptable degree, it must determine whether that risk can be reduced to a reasonable level by the imposition of one or more mitigation measures as conditions of approval.

186. N. Hofmann requested that, if that the Commission approves the affected turbines, several conditions be imposed. As part of its assessment of whether the unreasonable increase to safety risks can be adequately mitigated, the Commission will assess whether any of N. Hofmann's proposed conditions are necessary.

4.4.3.1 Should permanent meteorological towers to be located outside of five nautical miles of the Bow Island Airport?

187. N. Hofmann requested that the amended project's permanent meteorological towers be located outside of five nautical miles of the Bow Island Airport. AECG submitted that the closest meteorological tower would be 4.5 nautical miles from the Bow Island Airport and that its meteorological tower locations were selected to provide sufficient coverage of the project area and to be properly sited considering the wide range of constraints which guide sitting decisions.

188. The Commission finds that the amended project's meteorological towers would be another obstacle for pilots to consider; however, the meteorological tower's impacts would be limited given that the towers are stationary and would not produce a wake turbulence in the same manner that a wind turbine would. Accordingly, the Commission will not impose this condition.

4.4.3.2 Should AECG be required to conduct post construction monitoring of wake turbulence within the amended project area?

189. N. Hofmann requested AECG conduct post-construction monitoring of wake turbulence within the amended project to ascertain wake turbulence levels at various distances from different wind turbines, whether there are wake influences from neighbouring wind farms, and whether overspeed zones occur in certain areas. N. Hofmann argued that this would help prove that AECG's models and predictions of turbulence were correct.

190. AECG responded that in the case of turbulence, there is no clear standard of an unsafe level of turbulence and the expectation is that such a level would vary greatly between kinds of aircraft. It added that in relation to the aircraft used by N. Hofmann, the wake simulation study conducted by Dr. Rogers suggested that even relatively high levels of turbulence very close to an operating turbine blade are not unsafe. AECG also submitted that it is not clear how such monitoring would be conducted and that it would not be a normal function of meteorological towers to measure such data.

191. The Commission understands that measuring wake turbulence with a meteorological tower would not be the tower's primary function. The Commission also agrees with AECG that it is unclear how such monitoring would be accurately undertaken, and how such data would be considered in relation to the amended project. Accordingly, the Commission will not impose this condition.

4.4.3.3 Should AECG be required to provide N. Hofmann with required information for Transport Canada or NAV Canada submissions to Canada Flight Supplement showing turbine locations and specifications, or to provide that information themselves?

192. N. Hofmann requested that AECG be required to provide him with required information for Transport Canada or NAV Canada submissions to Canada Flight Supplement showing turbine locations and specifications, or to provide that information themselves. AECG stated that it is committed to providing this required information for the amended project to Transport Canada to ensure that all aviators operating out of the Bow Island Airport are aware of the locations, heights, and diameters of the amended project's turbines.

193. The Commission finds that AECG submitting the information to the relevant agencies itself is appropriate. The Commission does not require this to be a condition of its approval.

4.4.3.4 Should the Commission alter the turbine shut-off protocol it imposed in Decision 27561-D01-2023?

194. In Decision 27561-D01-2023, the Commission imposed a condition requiring AECG to implement a turbine shut-off protocol to help mitigate impacts to agricultural operations intending to aerially spray in the amended project area. The condition is as follows:

> [AECG] shall implement a turbine shut-off protocol to be followed when it receives a request at least 24 hours in advance of impacted aerial spraying operations. The protocol will include the direct phone number for the site supervisor and the remote operations control centre, a step-by-step process to identify which turbines should be curtailed, halted and/or yawed, a confirmation of dates and times for planned aerial spraying activities, a process to ensure the site is safe and secure for spraying to occur, and a process to ensure that [AECG] is notified when spraying is completed. [AECG] shall comply with the protocol, and shall also use reasonable efforts to satisfy the requirements of the protocol promptly when a request is made less than 24 hours in advance due to exigent circumstances.[141]

195. N. Hofmann requested that AECG immediately shutdown turbines at N. Hofmann's request for aerial spraying, for any turbines that N. Hofmann deems to add risk to the flight whether the aircraft is in ferry or actually spraying. Conversely, AECG reaffirmed its commitment to the Commission's turbine shut-off protocol condition for the affected turbines. AECG added that that the protocol was still in development and the setback distance for turbines to be shut-off from the aerial spraying site would be ten rotor diameters. It explained that this was because Dr. Rogers indicated that a 10 rotor diameter threshold distance for shutting down turbines when flying through the wind project would also be adequate to protect against any potential hazards from wind turbine wake turbulence.

196. Consistent with Decision 27561-D01-2023, the Commission finds that it will require this condition of approval (paragraph 194 above) for the affected turbines, with respect to aerial spraying operations in the vicinity of the affected turbines. The Commission emphasizes that this decision does not modify the Commission's previous direction related to aerial spraying among turbines. This decision is limited to the aviation safety, which refers to the safety of aircraft operations when arriving at, departing from, or related flight paths in the immediate vicinity of the Bow Island Airport, and the Commission has not considered the wake turbulence data as it would relate to aerial spraying operations being conducted among turbines. As a result, the Commission will not modify the condition to include a specific rotor diameter threshold distance for shutting down turbines.

4.4.3.5 Should the Commission impose a condition to curtail the amended project when the wind is blowing from the southeast towards the Bow Island Airport?

197. N. Hofmann requested a condition requiring automatic curtailment of all turbines within a five nautical mile radius of the Bow Island Airport when the wind speeds are below 45 km/hr, and the wind is blowing from the amended project towards the Bow Island Airport from between 90 degrees to 180 degrees (the proposed condition). N. Hofmann explained that the proposed condition would allow aircraft to safely come and go from the Bow Island Airport.[142]

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[141] Decision 27561-D01-2023: RES Forty Mile Wind GP Corp. – Forty Mile Wind Power Project Amendments, Proceeding 27561, Applications 27561-A001 to 27561-A003, June 9, 2023, page 21, paragraph 69.

[142] Exhibit 27561-X0249, Nathan Hofmann's answers to AUC questions, PDF page 59 initially outlined the proposed condition. It was later adjusted in Transcript, Volume 7, page 938, lines 10-16.

198. N. Hofmann argued that there has to be a range of degrees in the proposed condition because using 110 degrees without a range would only eliminate turbulence from turbines T4 and T5, and that would not be sufficient. During argument, N. Hofmann refined his request and submitted that curtailment should occur between April 15 to October 1 since those are the times when he is engaging in aerial spray and aerial seeding operations. N. Hofmann also clarified that the time of day should be a half hour before sunrise and a half hour after sunset because he can still be in the air and enroute to a clients' lands. N. Hofmann estimated that the proposed condition would impact one per cent of the energy production of the amended project and suggested that it would not threaten the economic viability of the amended project.

199. AECG strongly disagreed with the imposition of the proposed condition. It argued that the purpose of imposing an operational condition on a power plant approval is to mitigate or eliminate a negative effect that is likely to result from the operation of the facility. It further argued that the evidence does not support the Commission finding that there are aviation safety impacts associated with flight operations at the aerodrome that are likely to be negatively impacted from the operation of the affected turbines, regardless of wind direction. It submitted that, as stated by Dr. Rogers, the setback distance of the turbines from the aerodrome would be sufficient to mitigate any risks imposed by turbine wakes to aircraft operating from the aerodrome and therefore there would be no significant impact that must be mitigated through the imposition of the proposed condition.

200. However, AECG suggested that if the Commission decided to implement a condition of this nature, the Commission should modify the proposed condition. AECG noted that the proposed condition would apply to all southeast winds, but Dr. Rogers's analysis considered the "worst-case scenario" as it pertains to potential wake effects at the aerodrome to be at a 110-degree wind direction.[143] It submitted that any condition should therefore be limited to occurrences within a 110-degree wind direction. It added that assuming that the purpose of the proposed condition would be to address wake effects, and setting aside the fact that the evidence is clear that the wake does not extend anywhere close to the aerodrome or the flight circuits, any condition should, at most, only relate to the closest turbines to the Bow Island Airport, namely turbines T4 and T5.

201. AECG explained that even with the above limitations added to the proposed condition, the impact would be significant to the project and not necessarily limited to one percent of project operating time, as suggested by N. Hofmann. AECG testified that it did not agree with the calculations conducted by N. Hofmann, and submitted that determining the specific impact of the proposed condition would require data which does not exist about correlations between wind direction and timing, including seasonality.

202. AECG added that if the proposed condition is imposed, it would create an inconsistency between how the Commission is treating the amended project and how it treated the Halkirk 2 Wind Power Project.[144] It submitted that for the Halkirk 2 Wind Power Project, there was no consideration as to wake effects from turbines sited more than 4,000 metres from the aerodromes, and the condition that was imposed relating to assessing wake impacts was for three

[143] The term "worst-case" is used in Dr. Rogers's reply evidence to refer to a notional worst-case scenario in which the wind is blowing directly from the nearest turbine towards the Bow Island Airport: Exhibit 27561-X0290, Appendix B – Expert Report Reply of Dr. Jonathon Rogers of Persimia, LLC, PDF page 13.

[144] Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023.

turbines, all of which were located within the Transport Canada mandated circuit of one of the aerodromes, which is in contrast to the amended project's turbine locations.

203. In Section 4.4.2, the Commission found that the risk associated with the aviation safety impacts of all affected turbines other than turbines T4 and T5 are reasonable and therefore, do not require the Commission to impose further conditions in order to adequately mitigate the risk. The Commission also found that the aviation safety impacts of turbines T4 and T5 may increase risk at the Bow Island Airport to an unacceptable degree. On this basis, the Commission has determined that it will not impose the proposed condition on the affected turbines other than turbines T4 and T5. The Commission has also determined that a condition similar to the proposed condition will reduce the aviation safety risk posed by turbines T4 and T5 to a reasonable level. Below, the Commission assesses what mitigation measures are necessary to do so (the shut-off condition).

204. The purpose of the shut-off condition is to reduce the aviation safety risk at the Bow Island Airport. During its busiest days, the majority of flights at the Bow Island Airport are by Top Crop and its competitors for conducting aerial spraying operations.[145] Therefore, the Commission finds that it is not necessary for the shut-off condition to apply when aerial spraying operations do not occur. Based on N. Hofmann's evidence concerning Top Crop's aerial spraying operations, the Commission finds that the shut-off condition shall only apply when a request is received by AECG from an aerial spray applicator: (i) on or between April 15 and October 1, (ii) between a half hour before sunrise and a half hour after sunset, and (iii) the expected wind speeds during the requested shut-off period are below 45 km/h.

205. The Commission acknowledges AECG's argument that Dr. Rogers's analysis considered the worst-case scenario as it pertains to potential wake effects at the aerodrome to be at a 110-degree wind direction, the direction in which the wake from the closest turbine, T4, would be propagating towards the Bow Island Airport. However, in Section 4.3.3, the Commission found that there is likely to be an additive effect when the wakes from multiple turbines interact, and that the exact nature and degree of penetration across different atmospheric and wind conditions is somewhat uncertain. Therefore, the Commission finds that it is not necessary to extend the shut-off condition to all occurrences when the wind is blowing from the amended project towards the Bow Island Airport from between 90 degrees to 180 degrees (as proposed by N. Hofmann). The Commission also finds that it is insufficient to limit the shut-off condition to occurrences within a 110-degree wind direction (as proposed by AECG).

206. There is uncertainty about the nature and degree of wake turbulence from turbines T4 and T5 in conditions other than wind blowing at a heading of 110 degrees at a wind speed of eight metres per second (28.8 km/h), and with an ambulant turbulence intensity of 12 per cent. Considering this uncertainty, and applying the precautionary principle in light of the nexus of this issue with aviation safety, the Commission finds that imposing the shut-off condition when the wind is blowing at a heading of between 100 and 120 degrees (that is, plus or minus 10 degrees from the direction in which the wake from turbines T4 and T5 would be propagating directly towards the Bow Island Airport) will adequately mitigate the risk posed by turbines T4 and T5.

207. Further, given Dr. Rogers's evidence that wind direction data for the project area indicates that the wind heading is within plus or minus 15 degrees of 110 degrees for only five to

[145] Transcript, Volume 6, page 819, lines 1-11.

six per cent of the year and that for approximately 90 per cent of the year, the wake turbulence would be propagating away from the Bow Island Airport, the Commission finds that it is reasonable to impose the shut-off condition when the wind is blowing at a heading of between 100 and 120 degrees as impacts to the operations of the amended project are not likely to be significant. The Commission also notes that potential impact of the shut-off condition on the operations of the amended project are further reduced in light of the restrictions detailed at paragraph 204.

208. Regarding AECG's argument that if a condition is imposed, an inconsistency would arise between the Commission's treatment of the amended project and how it treated the Halkirk 2 Wind Power Project, the Commission emphasizes that it considers each application on its own unique facts and must determine the amendment applications in this proceeding based on the record before it. In Decision 27691-D01-2023,[146] the condition imposed by the Commission was based on the evidence in that proceeding, including the aviation safety concerns of that intervener-pilot and the specific operations at that aerodrome. In particular, the intervener-pilot in the Halkirk 2 proceeding expressed concerns about the impacts of the Halkirk 2 Wind Power Project on a pilot's ability to perform a circuit at his aerodrome. The pilot-intervener provided substantial evidence concerning the circuits that he flies around his aerodrome and the importance of flying circuits to the safe operation of his aerodrome. He did not fly over maximum gross weight aerial applicator aircraft and he did not operate a company that flew up to 30 flights per day at the aerodrome, as is the case with N. Hofmann at the Bow Island Airport.

209. The Commission therefore imposes the following condition of approval for Phase 1 of the Forty Mile Wind Power Project:

a. AECG shall include a provision in the turbine shut-off protocol, in relation to arrivals and departures at the Bow Island Airport (the Aerodrome Provision). The Aerodrome Provision shall provide that requests may be made by an aerial spray applicator, to halt or curtail turbines T4 and T5, if all of the following conditions are satisfied:

    i. The requested period to halt or curtail the turbines will occur on or between April 15 to October 1.

    ii. The requested period to halt or curtail the turbines will occur between 30 minutes before sunrise, and 30 minutes after sunset on the relevant day(s).

    iii. The wind speed is expected to be below 45 km/h during the requested period to halt or curtail the turbines.

    iv. The wind direction during the requested period to halt or curtail the turbines is expected to be at a heading between 100 degrees and 120 degrees.

    The Aerodrome Provision shall also provide that the aerial applicator must make their request as early as possible; that AECG must use reasonable efforts to comply with the request promptly; and that the aerial applicator must notify AECG immediately when the relevant aerial spraying activities are complete.

[146] Decision 27691-D01-2023: Capital Power Generation Services Inc. – Halkirk 2 Wind Power Project Amendment, Proceeding 27691, Applications 27691-A001 and 27691-A002, July 27, 2023.

4.5 Conclusion regarding aviation safety

210. Based on the condition imposed by the Commission, the Commission is satisfied that the aviation safety impacts of the amended project are reasonable or can be mitigated to an acceptable degree. The Commission has considered the adverse impacts and benefits of the amended project as set out in Decision 27561-D01-2023, in conjunction with the impacts set out in this decision. For the reasons discussed, the Commission finds that the amended project is in the public interest.

5 Discussion and findings related to the Applicant's name change

211. On July 25, 2023, the applicant stated that pursuant to a share purchase agreement, Acciona Energy Canada Global Inc. acquired all outstanding share of the applicant, and that the applicant was no longer a wholly owned subsidiary of Renewable Energy Systems Canada Inc. In a followup letter filed on August 2, 2023, the applicant stated that it had undergone a corporate name change from RES to AECG. The applicant requested that the Commission transfer the amended project's existing approvals to AECG and that any future approvals be granted to AECG.

212. In accordance with the requirements of Section 23 of *the Hydro and Electric Energy Act*, the applicant (AECG), continues to be incorporated under the *Business Corporations Act*. Based upon the information provided, AECG has demonstrated that it is eligible to hold the power plant approval and substation permit and licence in its name.

213. The Commission approves the requested transfer of the amended project's approvals to AECG. The Commission notes that while the *Generation Approvals Pause Regulation* states the Commission "shall not grant an approval" in relation to certain projects under sections 9 or 11 of the *Hydro and Electric Energy Act*, the *Hydro and Electric Energy Act* contemplates a distinction between "the assignment or transfer of approvals"[147] and the issuance of an approval pursuant to sections 9 or 11. The Commission concludes that transfer of an approval is not contemplated by the regulation.

[147] *Hydro and Electric Energy Act*, Section 5(1)(l).

6 Decision

214. Pursuant to sections 11, 14, 15 and 19 of the *Hydro and Electric Energy Act*, the Commission approves the project and approval transfer and grants AECG Forty Mile Wind GP Corp. the following approvals:

- Appendix 1 – Power Plant Approval 27561-D06-2023, to construct and operate Forty Mile Wind Power Project Phase 1.
- Appendix 2 – Power Plant Approval 27561-D07-2023, to construct and operate Forty Mile Wind Power Project Phase 2.
- Appendix 3 – Permit and Licence 27561-D08-2023, to construct and operate the Forty Mile 516S Substation.

215. The appendices will be distributed separately.

Dated on November 8, 2023.

Alberta Utilities Commission

(original signed by)

Douglas A. Larder, KC
Vice-Chair

(original signed by)

Matthew Oliver, CD
Commission Member

Appendix A – Proceeding participants

Name of organization (abbreviation) **Company name of counsel or representative**
AECG Forty Mile Wind GP Corp. (AECG) Terri-Lee Oleniuk Matt Hammer
Nathan Hofmann Darryl Bennet

Alberta Utilities Commission Commission panel Douglas A. Larder, KC, Vice-Chair Matthew Oliver, CD, Commission Member Commission staff Patrick Schembri (Commission counsel) Alyssa Marshall (Commission counsel) Fatiha Rezwan Allan Anderson

Appendix B – Oral hearing – registered appearances

Name of organization (abbreviation) Name of counsel or representative	Witnesses
AECG Forty Mile Wind GP Corp. Terri-Lee Oleniuk Matt Hammer	Peter Clibbon Rebecca Crump Jonathan Rogers Shawn Sutherland Doug Francoeur
Nathan Hofmann Darryl Bennet	Nathan Hofmann

Appendix C – Summary of Commission condition of approval in the decision

This section is intended to provide a summary of all conditions of approval specified in the decision for the convenience of readers. In the event of any difference between the conditions in this section and those in the main body of the decision, the wording in the main body of the decision shall prevail.

The following is a condition of Decision 27561-D05-2023 that does not require a subsequent filing with the Commission and will be included as a condition of Power Plant Approval 27561-D06-2023:

a. AECG shall include a provision in the turbine shut-off protocol, in relation to arrivals and departures at the Bow Island Airport (the Aerodrome Provision). The Aerodrome Provision shall provide that requests may be made by an aerial spray applicator, to halt or curtail turbines T4 and T5, if all of the following conditions are satisfied:

    i. The requested period to halt or curtail the turbines will occur on or between April 15 to October 1.

    ii. The requested period to halt or curtail the turbines will occur between 30 minutes before sunrise, and 30 minutes after sunset on the relevant day(s).

    iii. The wind speed is expected to be below 45 km/h during the requested period to halt or curtail the turbines.

    iv. The wind direction during the requested period to halt or curtail the turbines is expected to be at a heading between 100 degrees and 120 degrees.

    The Aerodrome Provision shall also provide that the aerial applicator must make their request as early as possible; that AECG must use reasonable efforts to comply with the request promptly; and that the aerial applicator must notify AECG immediately when the relevant aerial spraying activities are complete.

Appendix D – Typical aircraft circuit, including 10 rotor diameter radii from the turbines[148]

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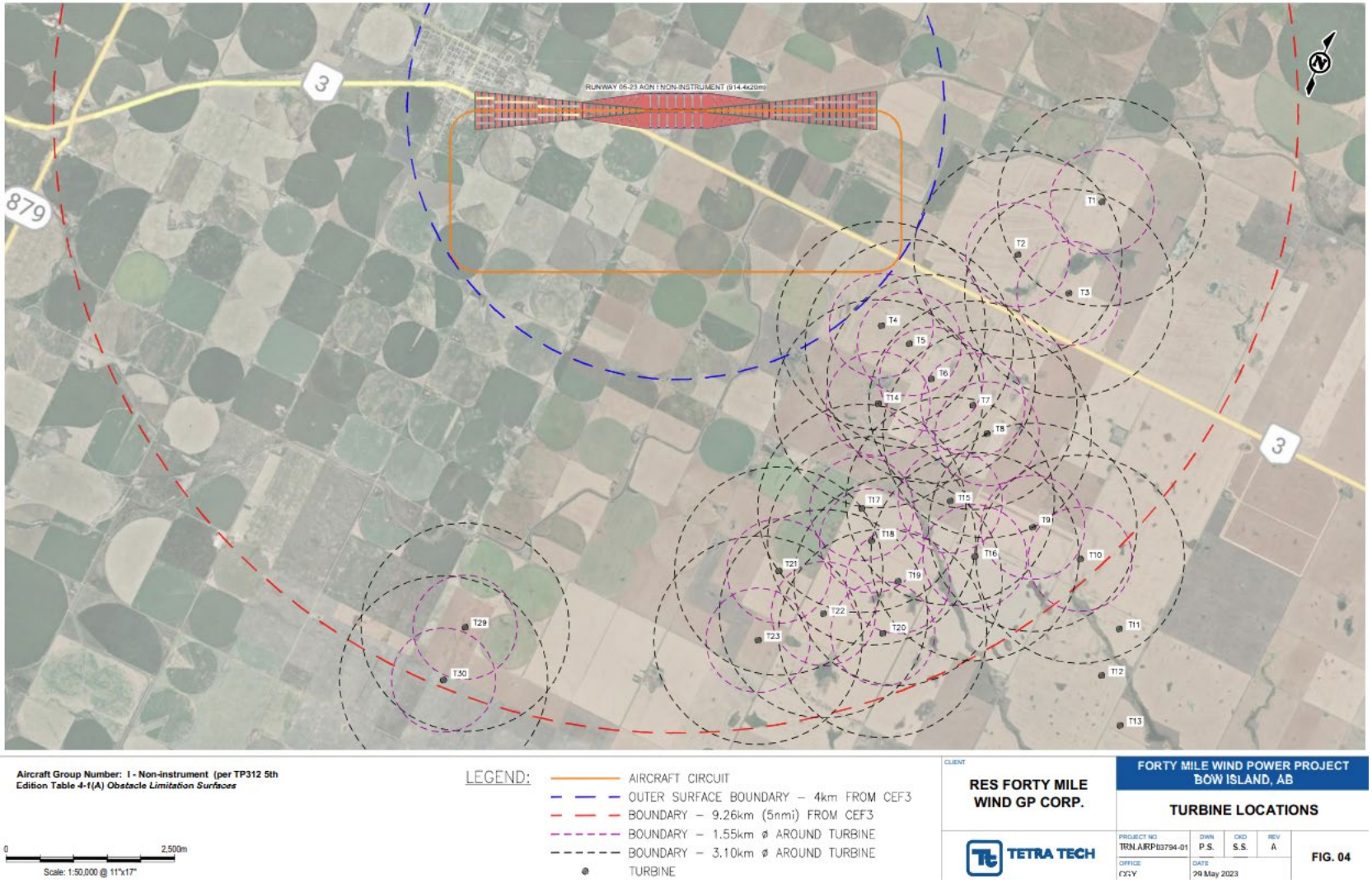

[148] Exhibit 27561-X0242, RES Response to Hofmann IR 1 – Redacted, PDF page 35.